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Convention Anticipations

ALTHOUGH the Convention which opens next Monday at Edinburgh has not this year an officially "national" status, it will be as nearly so as possible, having regard to the number of delegates who will be present and their widely representative character.

All sections of the electrical industry—manufacturers, power and lighting companies, wholesalers, contractors, and various organisations—have accepted the invitations extended by the Incorporated Municipal Electrical Association, meeting under the presidency of Mr. E. Seddon, to join with it in making a really big electrical event again this year.

Edinburgh, which is one of those towns that really does deserve its reputation as standing for some of the more gracious aspects of life (what a city to light!), has also more material claims to be regarded as a good conference centre.

The accommodation in Waverley Market is much more spacious than has hitherto been available for the annual exhibition, and this has enabled its scope to be extended beyond the domestic field (which, however, retains its predominance), thus giving opportunities to Scottish manufacturers of heavier apparatus to contribute their quota. The number of firms taking space in the exhibition is about twice as many as it was last year.

Conducive, also, to a successful gathering is the hopeful attitude towards the future which we have noticed during recent visits to Scotland. This result of industrial activity is in very welcome contrast to the depressed outlook generally apparent in the past few years.

The works visits arranged should be full of interest. Portobello is a fine base-load station, well up in the thermal-efficiency table, and using "heat rejected to condenser" in a novel way—the warming of water in a large, up-to-date swimming pool—while the opportunity of visiting the Bruce Peebles works does not often occur to those living south of the Tweed. Judged from bookings the day to be spent viewing the water-power stations in the Grampians seems one of the most popular features of the programme of events.

Technical papers deal with water-heating and street lighting—subjects about which there is always something more to be said—and commercial cooking, which has not perhaps received so much attention of late as its present importance and the pioneering work attached to it would appear to merit. The social programme (including the golf tournament) follows tradition, and there seems to be no reason to depart from precedent in this respect.

Little time will be left to those who conscientiously carry out the full agenda to enjoy a tithe of all that is offered by a district rich in natural advantages and historical associations, but we believe that any who can prolong their stay over the week-end will not be disappointed. Moreover, I.E.E. members will be in good time for the Institution's Summer Meeting which is being held in the West of Scotland during the following week.

Altogether, the prospects are that the coming I.M.E.A. Convention will prove as useful for its inherently serious purposes, and as incidentally enjoyable, as the most notable of its predecessors.

I.E.E. Council Nominations

THE nomination of Mr. H. T. Young as the next President of the Institution of Electrical Engineers is a recognition, perhaps overdue, of the professional status of installation work. It might also, perhaps, be regarded as indicating the importance attached by the Council to the welfare of students, since Mr. Young has been officially associated with them for several years. Another installation engineer whose name is being put forward as a member of Council is Mr. H. J. Cash, vice-chairman of the Wiring Regulations Committee. Messrs. Johnstone Wright (nominated as vice-president) and F. Forrest (president-elect I.M.E.A.) have had long and distinguished connections with electricity supply, and the ripe experience of Mr. F. W. Crawter will once more be available in the post

of honorary treasurer. Varied manufacturing aspects are represented by Messrs. T. Carter, S. W. Melsom and E. M. Lee, the last-named of whom has not previously served on the Council and has been chosen to look after the interests of the associates. Other new names are those of Mr. C. E. Fairburn, whose experience in electric traction makes his nomination opportune, and Mr. C. R. Westlake (associate members' representative) who is probably known best for his work in Northern Ireland.

Foreshadowings

To the electrical engineer the most fascinating thing about the exhibits at the annual conversazione held by the Royal Society is that they so often represent practical developments in the embryo stage. For example, two methods of approach towards colour correction for the electric-discharge lamp were demonstrated this year: one showed how the lines of the spectrum could be broadened by the use of very high pressures; the other gave promise of obtaining light of almost any desired colour by the application of luminescent powder to the outer jacket of the lamp without material loss of efficiency. Those who have spent weary hours in working out the distribution of voltages and currents in a.c. networks would have appreciated the way in which a "network calculator" answered such questions out-of-hand. A temperature-compensated a.c. electrolytic meter presented a novelty, while the control of radiant heat by exploiting the possibilities of metal surfaces will, no doubt, find more extended scope in future. A working model of a cathode-ray tube was a reminder of how near we are to a public television service. Super-conductivity, automatic recording of infra-red and ultra-violet rays, and various X-ray studies were also among the exhibits described on a later page that provide rich material for the drawing of inferences.

I.M.E.A. CONVENTION

Our Special Issue of Friday next will contain a report of the proceedings with many pictures, also a survey of the exhibition and a number of specially contributed articles.

Profiting by Experience

THE result of the official inquiry into the Bradford breakdown of last February is not yet available, but Mr. T. Roles, the city electrical engineer and manager, has lost little time in putting forward a scheme, based upon his recent experience, with a view to ensuring continuity of supply. The erection of two new 6.6-kV switch-houses at a different point on the power-station site to replace the one destroyed by fire was to be expected and accounts for more than one-third of the capital expenditure of over £340,000. A new 33-kV step-up sub-station at Valley Road with its 33-kV feeders is the biggest item of this amount. This will provide for an increased output from the power station; so also will the replacement of several 6.6-kV cables by those of larger cross-sectional area, but the value of having plenty of copper between different high-voltage sub-stations, as shown by the Hell Gate trouble, has presumably influenced the situation.

A Gas Triumph

THE Select Committee of the House of Commons which has had the Gas Light & Coke Company's Bill under consideration has approved the clause by which the company will secure powers to install gas-piping in municipal houses in its area during their construction. This extraordinary interference with public authorities by a private concern should not be allowed to pass without question when the Bill comes before the House for third reading. Why did not the company go further and ask that *all* houses, public or private, should be so dealt with? Nowadays there are numbers of houses going up for which gas is not being considered. If it is considered desirable that new houses should be piped for gas, as well as wired for electricity, surely the matter should be dealt with in a public measure and not merely in a clause in a private Act.

Fuses on D.C. Circuits

WHILE it is now recognised that an oil switch may interrupt an a.c. circuit more nearly at zero pause of current at its maximum rated short-circuit capacity than at lower values, it is difficult to see why somewhat analogous effects should obtain with fuses on d.c. circuits. Some types of cartridge fuse recently tested at the National Physical Laboratory, which successfully cleared heavy d.c. short circuits, failed at comparatively light currents, *e.g.*, five times full load. This seems to indicate the need to test such fuses at various degrees of short circuit, as is done with high-voltage switchgear. The reason for the apparent anomaly is at the moment obscure. Is it that the instantaneous melting of the fusible metal under the worst conditions leaves the container no time to heat up as it might do at a slower rate of volatilisation?

Skill Required

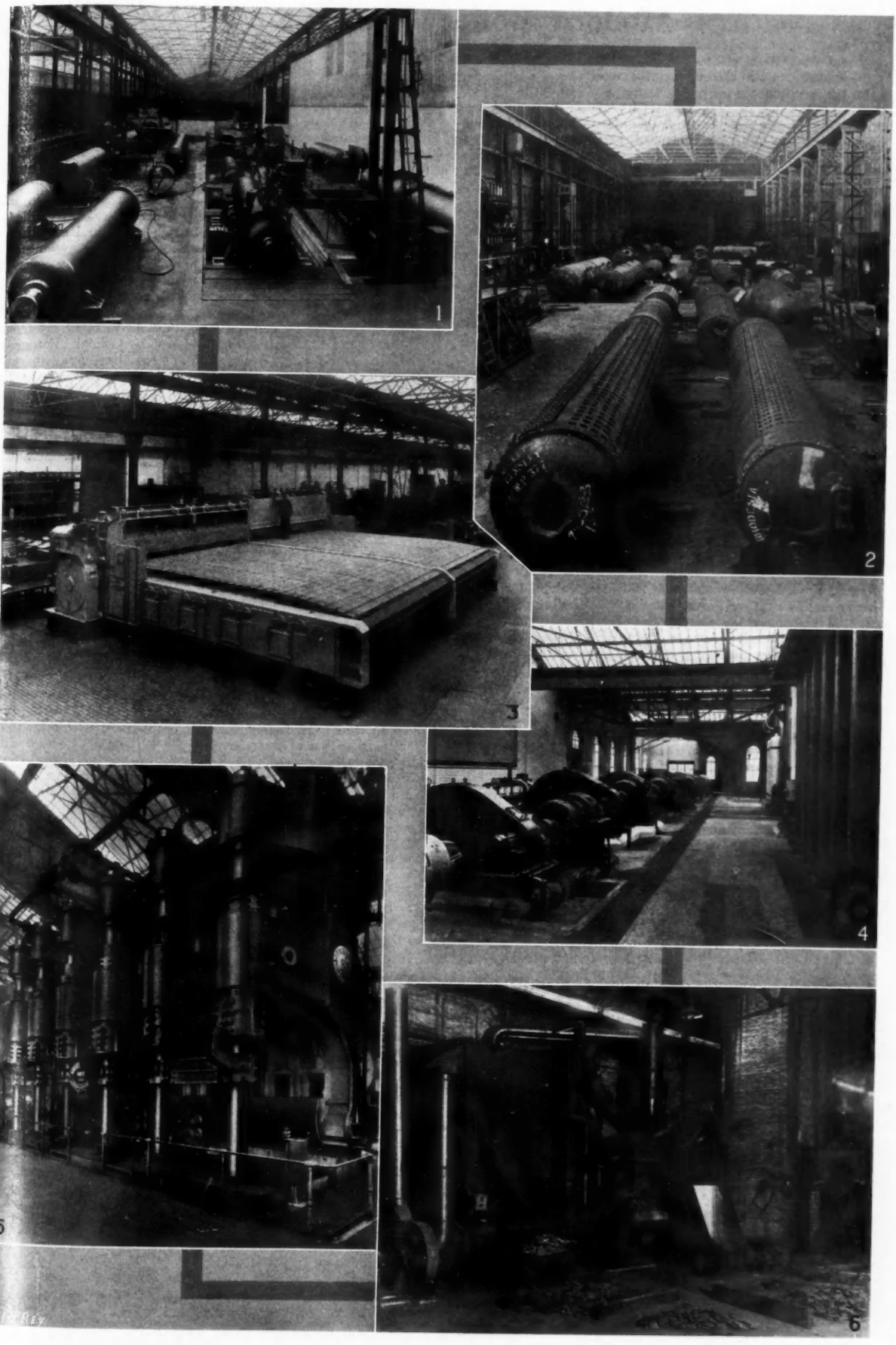
THE main technical advantage that an electric furnace has over a fuel-fired open-hearth furnace is that the steel can be heated in an atmosphere devoid of oxygen. A reducing slag is formed on the liquid metal and refining reactions occur that are not practicable with furnaces fired by the combustion of fuel within them. The good results and the ease of handling and control obtained by electrical methods may, however, prove misleading. In a circular issued by the National Bureau of Standards (U.S.A.) on "Production, Heat Treatment and Properties of Iron Alloys," it is considered desirable to emphasise that steel is not necessarily of high quality simply because it is "electric." Knowledge and skill remain essential.

Overhead Urban Distribution

A CHANGE-OVER from overhead to underground cable was considered when the overloaded and obsolete distribution system at Lincoln, Neb., had recently to be laid out afresh. The population is 80,000 and the average load density 43,500 kVA per sq. mile. The cost of an underground system was found, according to the *Electrical World*, to be from 50 to 80 per cent. more than the complete reconstruction of the network by insulated cable run overhead. The higher cost was mainly due to the need to avoid water, gas and telephone services. This provides an illustration of the way in which the advantages of low initial costs in going overhead when opening up a new district may be more than offset by letting other concerns stake out their claims first.

The Importance of the Battery

THE storage battery appears to be going from strength to strength; its scope is rapidly expanding and the outlook is bright. Speaking at the annual meeting of the Chloride Electrical Storage Co., on Friday of last week, Mr. W. S. Naylor, the chairman, radiated optimism—and with good reason. For one thing, over 600 new electric vehicles went on to the roads last year, and each required a substantial battery. Mr. Naylor mentioned one firm of milk distributors which now operates well over a hundred of these vehicles and another concern which ordered fifty vans for bread delivery after giving two models a few months' trial. Another direction in which batteries are being employed extensively is in emergency lighting systems. The Chloride Company's financial results have fully justified Mr. Naylor's optimism.



Boiler production at the B. & W. works, Renfrew. **(See next page)**

1. The fusion welding bay. 2. The light drum shop. 3. The 33-ft. wide stoker for the Klip station, South Africa. 4. The hydraulic pump house, showing the bottles of the air-loaded accumulator system. 5. An 8,000-ton plate-bending press. 6. An automatic sand-blasting machine.

Modern Boiler Manufacture

Electrical applications to heavy engineering

BROADLY, boilers of direct interest to electrical men of to-day may be divided into two classes, longitudinal-drum type equipments for pressures up to, say, 300 lb. per sq. in. and cross-drum boilers for much higher pressures. At any rate, we find this classification convenient in recording our impressions of a recent visit to the Renfrew works of Messrs. Babcock & Wilcox, Ltd., where a separate shop is devoted to the production of each class of drum. In the high-pressure-drum shop we saw many examples of solid-forged, riveted and fusion welded drums, while for really heavy engineering we think that the cold bending of the substantial plates for the riveted and welded equipments is of outstanding interest. A huge hydraulic cold-bending press, with an operating pressure of 8,000 tons, will form plates 40 ft. long and 2¼ in. thick, or shorter plates of greater thickness.

An aerial view of the Renfrew works

Stress relieving of cold-bent shells is of vital importance, and for this purpose there are two annealing furnaces, a vertical one which will accommodate shells 40 ft. long and a horizontal furnace for longer and larger diameter vessels. The former is in two vertical halves, and the front portion is drawn forward when a shell is inserted for treatment. Most low-pressure drums are of riveted construction. The fabrication work in this section (building up the shells prior to riveting) is of a different character from the "fabrication" carried out in the electrical manufacturing industry which connotes welding construction. It may be said, however, that the number of low-pressure welded drums shows every sign of increasing.

An indication of the extent to which fusion-welded construction is now employed for high-pressure boilers is a new welding bay 330 ft. long by 60 ft. wide, now almost completed. In addition to the welding machines this new shop is provided with three X-ray equipments, including a new one which will penetrate up to 4¼-in. plate. Every inch of weld in this "Class One" work is thoroughly examined under X-rays, and in the research laboratories, where we saw films which demonstrated how far welding practice has advanced; a standard porosity for reasonable life—thirty years perhaps—was shown, although the standard worked to by Babcock & Wilcox is much higher.

It was explained to us how, by penetrations through a portion of weld at different angles and comparisons of the corresponding distances between projection marks on a screen from fixed points in the weld, the actual position of a weld defect could be located. Once this is done it is an easy matter to "dig" out a piece of metal containing the defect and build the weld up again. This attainment of perfection in the manufacturing stages by so scientific a method seems to us to open up an entirely new aspect of engineering production. One of the many examples of welded construction we saw was a pressure vessel 2½ in. thick, while in a shop devoted to structural work for buildings, bunkers, conveyors and cranes we saw the bases and gussets being welded on to stanchions. Transport difficulties with large bunkers and structural members are overcome by part welding and part riveting in construction.

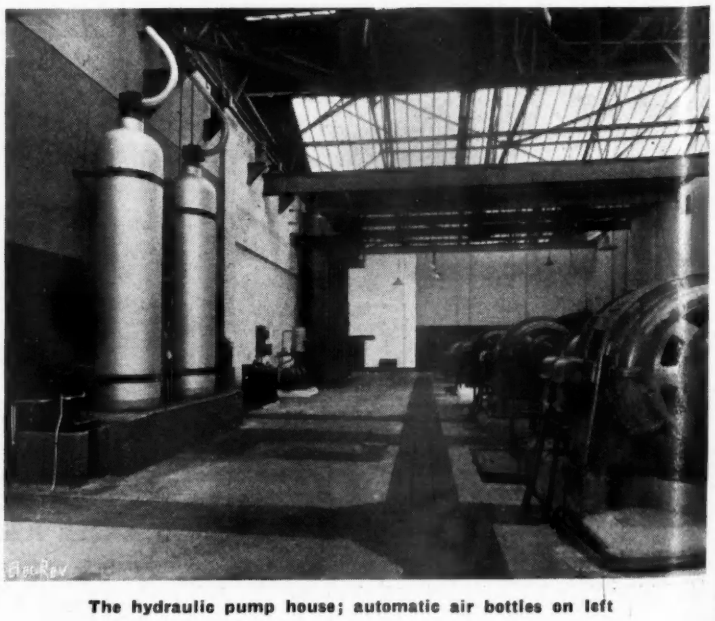
End closing of solid forged boxes for pressure parts of boilers, superheaters, Bailey furnaces and economisers is work carried on in the forge where we saw drumheads pressed out from steel-plate blanks on 500/600-ton hydraulic presses—truly heavy engineering. Three forging machines are devoted to the production of various kinds of mild-steel forgings, including the headpieces for B. and W. flash-welded economisers, and there is also a case-hardening and heat-treatment plant for axles, pins, bushes, etc. Closing in the end of the economiser headpieces after the insertion of a cast-iron filler (afterwards broken away) and the other operations leading up to flash welding of the tube is a really ingenious performance. Many components are produced in a smithy well equipped with coal-fired forges, an oil-fired furnace constructed on the air-jacketed system recently developed by Liptak Furnace Arches, Ltd., forge hammers up to 30-cwt. in size and two rivet-making machines.

Chain-grate, travelling-grate, Erith Roe retort type stokers, as well as mechanical parts for coal and ash-handling plants are all made and assembled in the stoker and conveyor shops where we saw under construction for the Klip station of the South African Electricity Commissioners, designed and operated by the Victoria Falls and Transvaal Power Company, a travelling-grate stoker measuring 33 ft. side to side and 20 ft. front to back. It has a driving unit on each side.

Stoker-grate links, of course, are a product of the foundry where a continuous casting installation represents a big advance in foundry practice. From a mixing plant sand is hopper fed to moulding machines from which the moulds are removed to an endless conveyor. The moulds are poured while they are in motion, and at the far end of the foundry they are automatically tipped to another conveyor at a lower level by which sand and castings are "spilled" on to a grating, the sand falling through on to a further conveyor for recirculation after treatment. A picture of the foundry appears on page 814.

Automatic sand blasting in a "Wheelabrator" is another interesting process. In 8 to 10 cwt. lots the link castings are skip fed into an enclosed chamber in which they are subjected to metallic sand blasting under compressed air while they are in motion. An elevator system inside the chamber continuously lifts the links to the top of the chamber when they are released and allowed to cascade over the heap. All steel castings are the products of electric furnaces, and coincident with extensions to the foundries now in hand the electric furnace equipment is being considerably increased.

Building up the boiler sections, each with its two headers and connecting tubes, and of the many varied formations of



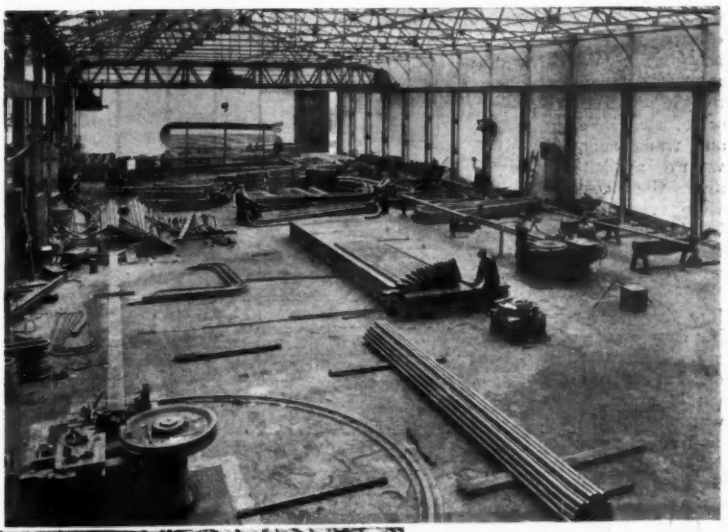
The hydraulic pump house; automatic air bottles on left

sections is the specialised work of the Section Shop, which includes expanding the tubes into the headers in specially designed machines, and flash welding tubes to tubes and tubes to economiser headpieces. We were told that nests involving continuous tube lengths up to 400 ft. have been built up in this way. But it was the extraordinary extent to which cold bending for all sizes of tubes is effected in this shop by many types of hydraulic machines which most impressed us.

In the pipe shop all kinds of high-class steam, feed-water, blow-off and other piping are specially shaped to the requirements of power-house lay-outs. Large pipes, filled with sand, are hot bent by a hydraulic machine after the style of a ship's winch. With the far end of the pipe anchored the winch revolves while it hugs the other end of the pipe. Pipes up to 18 in. in diameter can be dealt with in this way.

Machining to standard limits and tolerances on components of all descriptions is the work of a machine shop common to all departments, but almost every other shop has its complement of machine tools for work peculiar to the production of that shop. For instance, the machining of tube and hand holes in superheater boxes, Bailey wall boxes and mud-drums is a process of the Section Shop.

Associated with the research work of the mechanical and chemical laboratories is that relating to steam properties undertaken with the aid of an experimental high-pressure boiler which operates at a safety valve load of 1,575 lb. per sq. in. with a final steam temperature of 842 deg. F. It is fitted with a compartment-type travelling-grate stoker, Bailey furnace, inter-deck superheater, return bend type economiser, and a tubular air heater.



Two views of the Section Shop: The top picture shows Bailey wall tubes and machines for bending them, as well as superheater and reheater tubes. The machines for flash-welding the latter tubes are seen in the other illustration

The total works demand of about 6,000 kW is divided roughly into three equal groups—440 V a.c. and 220 V d.c., both for machine, individual and group drives, and hydraulically operated machinery which receives power from an electric pumping station. This station is equipped with two 300-gal. per min. pumps which operate at 1,200 lb. per sq. in., and are driven by 320-h.p. motors, and also six 250-gal. per min. pumps driven by 550-h.p. motors and operating at 2,500 lb. per sq. in. The lower-pressure pumps are connected to a couple of weight-loaded accumulators arranged for sequence working. The synchronous induction motors are controlled by accumulator limit switches *via* contactor starting equipment. Most of the lower-pressure hydraulic power is used in the foundry.

The large bending equipments and the heavy presses demand most of the higher-pressure power, the maximum water demand for which is 1,030 gal. per minute. These pumps operate in conjunction with an air-load accumulator system comprising two water bottles and six air bottles with an air-to-water ratio for the whole of 10 to 1. The water-bottle capacity is 440 gal. Connected with the water bottles is a mercury column, and the mercury level varies with the water level. At various mercury levels relays are automatically operated, and the relays, in turn, operate the corresponding pump motor starters.

The h.p. pumps are also fitted with electrically operated unloading valves, so that the pumps may be run continuously. The unloaders are switched "in" and "out" automatically, according to the draw-off of water to the shops. Normally four of the pumps are running continuously, with a fifth pump available for switching in automatically on peak loads and the sixth pump standing by. By means of a selector switch the sequence of operation of the motors is changed periodically, so that the performance of the equipments is kept fairly equal.

An outstanding feature of the hydraulic system is a 5-in. twin pipe line which conveys water at one ton per sq. in. from the pumping station to the header factory about half a mile away.

Public supply at 11 kV is received from the Yoker power station of the Clyde Valley Electrical Power Co., at five transformer stations situated at load centres in the works. Four of these provide the low-voltage a.c. supply, and the fifth one serves both a rotary-convertor station, with four 750-kW machines, for the d.c. load and the 3,300-V pump motors. The annual works consumption is about 20 million kWh, and the installation load factor is about 30 per cent.

Making Designs on Textile Fabrics

An electro-magnetic apparatus to be attached to a loom or flat knitting machine to do the special work that the Jacquard loom has done exclusively in the past is now being shown in America. The machine came originally from Europe, where it has been in operation on a number of knitting machines. The apparatus consists of a grille placed facing the needles of the knitting machine or the wires of the loom; within the grille are levers movable on their axles. Over this grille glides an electro-magnet that is connected with a transmitter which traverses a metal foil on which the design is drawn with insulating paint, thus making parts of the metal foil insulated and parts conducting. The movements of the electro-magnet and the transmitter are arranged to synchronise with the movement of the loom or flat knitting machine.

This patented Lefier process works as follows: A current is sent through the metal foil and the transmitter, the latter relaying the electric current, interrupted according to the design on the foil, to the electro-magnet. The interruptions of the current act on the hammer of the electro-magnet, which, in turn, acts on the levers placed within the grille, moving only the desired levers and putting these in position according to the design on the metal foil. The selected levers push into position the needles or wires needed to make the design.

Rural Transmission Voltages.

By R. F. Markham, Assoc.I.E.E.

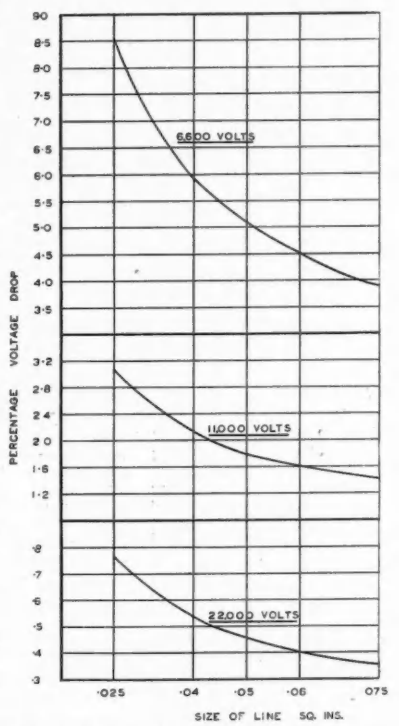
The influence of regulation and relative costs

THE general adoption of 11,000-V transmission for rural area development may be considered as a legacy from the now distant days before rural electrification was seriously considered and when extensions were made to adjacent urban areas or to supply nearby individual power loads. In the first place these extensions were made at 3,300 or 6,600 V but, due to the size of the loads and not to the distances, it soon became apparent that good voltage regulation and low costs demanded a higher voltage. Very soon, therefore, 11,000 V was adopted for this class of work, and as it fulfilled all requirements for a considerable period it became well established. Satisfactory materials and designs, not only for the overhead line but also for the associated cable, switchgear and transformers were available and the costs were reasonable, bearing in mind the volume of work done.

When therefore the pioneering supply authorities began to develop their rural areas, it was natural that a pressure of 11,000 V should be used if otherwise suitable.

Other engineers, not yet tied to any particular method, also found it an advantage to adopt 11,000 V if possible because of the designs existing and the favourable prices for materials already in fair demand.

Fortunately however, investigations from other points of view indicated that this system would be satisfactory and economical. The most important factors were voltage regulation and cost. The conditions were different from those for the urban extensions mentioned because, while rural loads were small, the distances were relatively great. The same conditions hold good to-day, and experience with both voltage regulation and costs has shown the wisdom of the decision made several years ago.



Percentage maximum voltage drop for a 12-mile line in a typical rural area with 50-kVA loads at 0.8 power factor every two miles

Of the two factors voltage regulation is the more important. It establishes a minimum limit for the pressure, if we assume that the conductors ought not to be greater than 0.05 or 0.06 sq. in. If a larger size of conductor is called for it is doubtful whether it will be economical for rural work, and a voltage higher than the minimum for satisfactory regulation should be considered. It is at this stage that the influence of cost determines whether the minimum possible pressure is the best one.

A Sample Case

No two rural areas are alike, but the type I have in mind is an area with hamlets and villages at intervals of two or three miles, each sub-station being of 25 or 50 kVA capacity and with isolated loads occasionally of 10 kVA. It is assumed that towns do not exist in the area or if they do that they will be supplied by special feeders of either larger size or higher voltage. The rural areas being developed vary considerably in extent, but in practice large areas are divided into smaller ones, each with its centre of distribution connected to the main source of power by special feeders. I consider therefore that the area may be assumed to extend, say, to ten or fifteen miles from the supply point.

The table shows the percentage voltage drop per mile with copper conductors to B.S. Specification at 60 deg. F. for single-circuit three-phase lines in triangular formation with 4 ft. horizontal by 2 ft. 9 in. vertical spacing for a load of 100 kVA. The figures are, however, sufficiently accurate for most purposes when the other types of conductors or slightly different spacings are used.

For single-phase lines, the percentage drops will be approximately double those in the table. The percentage drop with 6,600 V is 2.778 times that at 11,000 V, and at 3,300 V it is 11.11 times. Thus at 11,000 V we can transmit nearly three times the load or three times the distance practicable at 6,600 V. Put in another way, we can use at 11,000 V conductors which are about one-third of the size necessary at 6,600 V. For this reason, and since the difference in insulation costs is negligible, the economy of 11,000 V is obvious.

At 22,000 V the percentage drop is shown to be only one-fourth of that at 11,000 V, and from this it follows that the conductors could be one-fourth of the size. However, the size would then generally be too small to be practicable, and so the full saving (or in fact in many cases any saving at all) in the cost of the line could not be obtained. On the other hand, there is a very marked increase in the costs of cables, switchgear and transformers at this voltage, which will usually wipe out any saving on the line.

PERCENTAGE VOLTAGE DROP PER MILE PER 100 KVA FOR THREE-PHASE 50-CYCLE OVERHEAD LINES AT UNITY AND 0.8 POWER FACTORS.

Size of conductor sq. in.	3,300 V.		6,600 V.		11,000 V.		22,000 V.	
	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8
0.025	1.5977	1.6274	0.3994	0.4068	0.1438	0.1465	0.0360	0.0366
0.04	1.0064	1.1411	0.2516	0.2852	0.0906	0.1027	0.0226	0.0257
0.05	0.7988	0.9690	0.1997	0.2422	0.0719	0.0872	0.0180	0.0218
0.06	0.6659	0.8579	0.1665	0.2145	0.0599	0.0772	0.0150	0.0193
0.075	0.5323	0.7444	0.1331	0.1861	0.0479	0.0670	0.0120	0.0168
0.10	0.3989	0.6348	0.0977	0.1587	0.0359	0.0571	0.0090	0.0143

While the advantage of 11,000 V over lower voltages from the point of view of voltage regulation is clear, the table does not indicate whether it is high enough to give satisfactory regulation or whether it is unnecessarily high for the loads and distances in the rural area. This question can be answered by an inspection of the curves. These give the percentage voltage drop at the furthest point, assuming that the rural area extends twelve miles from the feeding point and that loads of 50 kVA are taken off every two miles. It will be seen that with 6,600 V even the largest size of conductor included is too small, bearing in mind that a margin must be available for possible future increases in loads. With 11,000 V the size mostly in demand, namely, 0.05 sq. in., would give a reasonable pressure drop and 0.025 sq. in. could be used in many cases for shorter routes and, of course, for spur lines.

At 22,000 V the curve indicates that 0.025 sq. in. is the only size which need be considered for the loads and distances stated. At first sight it would appear that in cases where 0.05 sq. in. 11,000-V conductors would be necessary, the saving by using 0.025 sq. in. 22,000 V might be worth while. However, at the latter pressure the extra costs of sub-stations and cable work are items which easily eliminate any saving on the line.

Two points must be borne in mind in this connection: first, the sub-stations will probably turn out to be a large number of small ones rather than a small number of 50 or 100 kVA; secondly, since at 11,000 V all spur lines would already be 0.025 sq. in., there would not be any saving on such lines to balance higher sub-station costs; in fact, the spur lines would actually cost slightly more because of the more expensive insulation.

Inadequate Protection

The need for care in providing adequate protection for domestic electrical appliances, so as to effect an immediate disconnection under the most difficult conditions of breakdown, is illustrated in an instance brought to our attention by Mr. A. L. Lunn. The article involved was an electric blanket of Continental origin with a series heating element arranged for single heat only, rated at 250 W (approximately) at 200-250 V. This was divided into three sections with an individual resistance of 81.5 ohms, by two sets of protective devices, each consisting of two spring-loaded temperature-operated switches with a thermostat between them. In addition a 5-A fuse was contained inside the bayonet connector on the main flexible load. Mr. Lunn informs us that a short-circuit occurred between the end of the first section (near the live side of one of the temperature switches) and the return wire from the third section, thus cutting out all internal protective devices but leaving the whole of one section of the element in circuit. The current, which was limited to 3 A by the internal resistance of the section, was enough to char the blanket badly with consequent damage, but being less than two-thirds of the capacity of the fuse was not enough to melt it.

A Scottish Tour

What the I.M.E.A. and I.E.E. will see

SOUTHERN Scotland will be the Mecca of large hordes of electrical people (and their ladies) during the next fortnight. On Monday next the Edinburgh Convention of the Incorporated Municipal Electrical Association commences, and it will last until the following Friday. In the course of this period visits will be paid to a number of places of electrical interest in the east of Scotland.

During the week after the Institution of Electrical Engineers is holding its summer meeting in the west of Scotland, and an even more intense programme of visits has been arranged.

In view of the interest attaching to the subject an ELECTRICAL REVIEW representative has been covering the area in advance, and the things seen during his tour are briefly dealt with in this survey. A number of the more important points in the area have received, and will receive, special attention. In the past two weeks we have published articles on the Clyde Valley and Edinburgh Corporation electricity supply undertakings and the Bruce Peebles works. This issue contains an illustrated description of Messrs. Babcock & Wilcox's works at Renfrew.

The Lochaber Water Power Scheme

By far the greater part of the water power in Great Britain is in Southern Scotland, and three major schemes are to be inspected. I.E.E. visitors to the British Aluminium Company's works will see the new Laggan and Treig dams constructed under the second stage of the development which was completed last year and which embraces a 2¾-mile tunnel connecting the two reservoirs formed by the dams. Laggan dam, constructed across the River Spean at a point about one mile above Tulloch railway station, is slightly curved in plan, founded on grey granite, and it carries an access roadway on piers and arches. It is 700 ft. long and 177 ft. high from the deepest foundation level to overflow level. A view of the dam appears at the head of this page.

The turbine room of Tongland (Galloway) power station

The Laggan-Treig tunnel, which carries water from the Laggan reservoir to the Treig reservoir, is about 14 ft. 6 in. in diameter, and is controlled at its inlet by a Glenfield engine-driven sluice gate.

The embankment-type Treig dam has been constructed across the River Treig at a point approximately a quarter of a mile north of Loch Treig. The length of the core wall of the dam is 675 ft., and it has a maximum depth of 122 ft.

The Ben Nevis pressure tunnel has an average diameter of about 15 ft., and it is fifteen miles long. From a surge chamber at its down-stream end two 12-ft. branch tunnels will connect up with the pipe lines. One of these branches has been completed; it serves two 5.5-ft. pipes which, in turn, feed five 42-in. pipes. Each of the smaller pipes supplies a 9,000-h.p. turbine driving two direct-current generators.

The turbines operate under a head of 800 ft. The power station will have an ultimate capacity of 120,000 h.p.; it is thus the largest single hydro-electric power station that can be constructed in Scotland.

The Galloway Scheme

Given fine weather the visit to the hydro-electric scheme of the Galloway Power Co. should prove the outstanding event of the I.E.E. summer meeting, for amid some of Scotland's most beautiful scenery it will be seen how the company has created new lochs, diverted rivers and left original water beds more or less dry to harness 100,000 kW of water power for the production of about 200 million kWh annually.

The continuous water-way of the Rivers Dee and Ken, and the Water of Deugh, embracing the River Dee and Loch Ken in the valley running between the sea on the south coast at Kirkcudbright and a point about forty miles north is Nature's contribution to the scheme. Water levels vary from about 700 ft. above O.D. in the north to about 20 ft. above O.D. in the south. The principal storage is Loch Doon, with a capacity of 2,900 million cu. ft. (23 million kWh).

The second important storage is at Clatteringshaws (1,250 million cu. ft.) about six miles west of Loch Ken. Water from this storage is utilised by a power station at Glenlee and is passed into the River Ken about three miles up-stream from the north end of Loch Ken. Between this point and Loch Doon in the north are three stations at Kendoon, Carsfad and Earlstoun, with subsidiary storages and headponds, all of which use the same water from the north. Thus all the water used by the four stations Kendoon, Carsfad, Earlstoun and Glenlee, is fed into Loch Ken, a narrow winding loch about ten miles long which forms the storage reservoir (329 million cu. ft.) for the fifth and lowest station of the scheme at Tongland.

When we visited the scheme recently, Glenlee and Tongland were the only two stations in commercial operation. The maximum working heads and capacities of the stations are: Kendoon 150 ft. and 21,000 kW, Carsfad 68 ft. and 12,000 kW, Earlstoun 70 ft. and 12,000 kW, Glenlee 380 ft. and 36,000 kW, and Tongland 120 ft. and 33,000 kW. The authorised and anticipated capital expenditure upon the scheme is three millions sterling, or just under £30 per kW. The scheme is designed essentially for peak-load work.

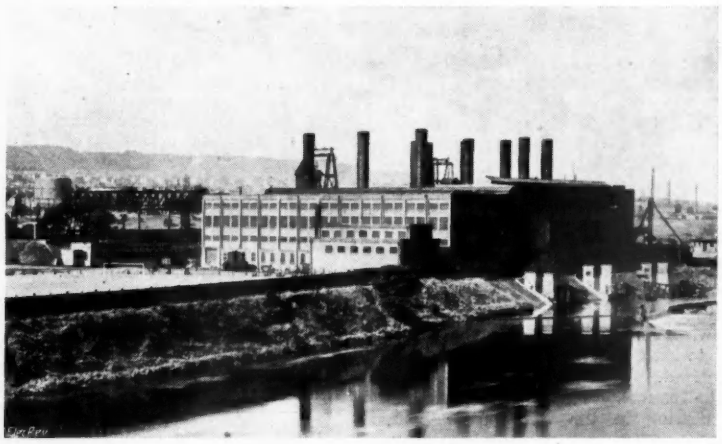
The Grampian Development

On Wednesday of the I.M.E.A. Convention week members will see how the differences in the water levels of Lochs Ericht, Rannoch and Tummel are being utilised for producing electricity. By a gravity dam across the river Ericht about a mile from the loch entrance, the water level has been raised by 14 ft. to 1,165 ft. above ordnance datum, while an artificial channel from the dam to the loch permits a draw-down to 5 ft. below the previous natural water level. The result is a maximum available storage at present of 3,425 million cu. ft. which, with a head of 485 ft. at the power station, is equivalent to 29 million kWh. Rannoch station is situated on the

northern shore at the western end of the loch with which its tail-race is in direct communication. It receives the Ericht water first *via* a 12-ft. concrete-lined tunnel 2¾ miles long which has been bored through the solid granite hills between the two lochs, and then through three pipe lines connecting the valve house at the end of the tunnel and the three 22,000-h.p. turbo-alternators at present installed at Rannoch.

By a control weir at Kinloch Rannoch at the east end of the loch the flow of water down the River Tummel is regulated and the loch water level controlled to give a maximum storage depth of 8 ft. A dam across the River Tummel at Dunalastair, about four miles east of Kinloch Rannoch, has resulted in sufficient storage in an area immediately west of that point to balance the fluctuation in the daily demand of water for the power house situated nearly three miles further east.

The water head at the Tummel power house is 170 ft., and because of this comparatively low-head horizontal turbines (24,000-h.p.) have been installed. Generation in both power houses is at 11,000 V, and at each generating point a transformer sub-station has been provided in which the voltage is stepped up to both 33 kV and 132 kV for transmission.



Clyde's Mill power station

The Clyde's Mill Power Station

The piecemeal construction of generating stations with load growth during the past twenty years, especially those of the War period when designers were scarce and safety by extravagance of material was aimed at, has all along been a trial to the station man.

But at the Clyde's Mill power station on the system of the Clyde Valley Electrical Power Co., I.E.E. members will see how order has been maintained through perhaps an exceptional number of development stages. Apart from this the general lay-out of the equipment itself affords some very interesting comparisons, particularly with regard to the war-time and immediate post-war construction, and the visit should prove an instructive one.

The station capacity has recently been increased to 80,000 kW by the installation of a new 30,000-kW Metropolitan-Vickers turbo-alternator which, from order to preliminary runs, was completed within nine months, and this work included an extension to the turbine building, lengthening an intake basin for the circulating water at the river side and the provision of auxiliaries. The overall thermal efficiency of the station last year was 19.28 per cent., 109,308 tons of coal being consumed with an average calorific value of 11,600 B.th.u. per lb.

The station output totalled a little over 160 million kWh and the maximum demand recorded was just under 60,000 kW.

Portobello Power Station

When we visited Edinburgh less than a month ago, Mr. E. Seddon, President, I.M.E.A., and his staff were busy drawing up specifications for the third and final extension at the Portobello power station. The new 30,000-kW set will bring the station capacity up to its maximum of 146,500 kW. Two 120,000-lb. per hour boilers are also to be installed, and the whole is to be in operation by the autumn of 1938.

Portobello was fourteenth on the 1935 list of British power stations with a thermal efficiency of 22.18 per cent. The coal consumption last year was 1.439 lb. per kWh generated and the m.d. was 102,100 kW.

Energy generated amounted to 311,951,900 kWh, and 100,441,200 kWh was exported to the C. E. B., while 198,903,160 kWh was supplied to the Edinburgh undertaking. The maximum demand for the undertaking alone was 70,400 kW, and the supply load factor (based on maximum demand) was 32.3 per cent.

A new swimming pool immediately adjacent to the power station will just about be completed by the time of the I.M.E.A. Convention, and partly because of this development the short individual boiler stacks are to be replaced by one 350 ft. high, common to the whole of the boiler plant. The water of the swimming pool, by the way, is to be cleansed on the continuous circulation and filtration principle, and make-up water will be provided from the power station condenser discharge, thus raising the temperature of the pool to a comfortable point.

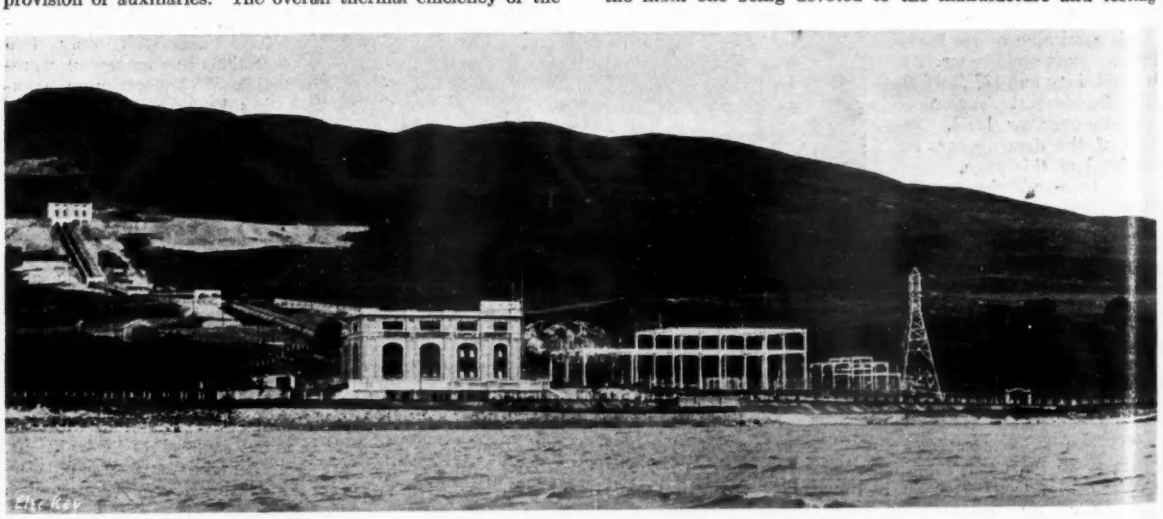
Circulating water for the power station is drawn from and returned to the Firth of Forth in a closed siphonic system. The station is situated on the fringe of a local coal field, there being twenty-nine pits within a radius of eight miles from the station.

The Works of Messrs. Bruce Peebles

Judging from what we saw at the Edinburgh works of Messrs. Bruce Peebles & Co., Ltd., their guests from the I.M.E.A. Convention on June 2nd will be surprised at the large amount of rotary equipment for a.c. to d.c. conversion which is at present under construction.

An electrical machinery shop of unusual length has five bays, the main one being devoted to the manufacture and testing of all classes of rotary plant of anything up to 10,000-kW capacity.

The special requirements incidental to the manufacture of mercury-arc rectifiers, including the need for the highest degree



The Rannoch (Grampians) power house, showing valve house, pipe line and outdoor sub-station

of cleanliness throughout the assembly stages are met by carrying out all machinery operations and the manufacture of component parts in the electrical machinery shop; so that the erection of rectifiers is carried out under ideal conditions in a shop complete with a mercury room and a dust-free room for final sealing

In a shop well equipped for the fabrication (welding) of various sizes of static and rotary equipment visitors will see the adaptation of both a.c. and d.c. to this class of work, while if the machines are in operation, inspection of the cutting of steel plates by oxy-coal-gas flame to pattern under pantograph control will be of special interest. In the transformer shop visitors will have the opportunity of seeing, at any rate, some of the components of the four 15,000-kVA transformers now under construction for the Central Elec-

Left: The machine shop at the Harland works. Right: Messrs. Mavor & Coulson's coal-cutter assembly gallery

tricity Board. Two of these are illustrated on the next page. A 500,000-V testing transformer adds interest to this section.

The B.E.P. Works at Alloa

For those who would like a lesson in modern welded construction, of the alternative I.E.E. visits on Thursday next we recommend the works of the Harland Engineering Co., Ltd., at Alloa, where recently we saw such components as circuit-breaker tanks, machine bed-plates, and stator frames for rotary equipment being built up. Fabricated bedplates are the latest, but logical development in this class of work by the company.

But perhaps the greatest feature of the scheme is the elimination of as much welding as possible by well-designed and skilful plate bending. In its simplest form the top and two sides of a bedplate are produced by bending down the ends of a steel blank, so that fabricating the end pieces of the bed is all that is necessary to complete the bed. We believe that the establishment of confidence in this latest type of welded constructional work represents a bigger advance than the actual engineering shop practice involved.

Evidence that the Harland Co. believes its own story is to be seen in a new pump-testing house of entirely welded construction. Under the floor of this house is a tank containing 100,000 gal. of water, and at two corners of the tank are deep wells to permit the testing of bore-hole pumps. A new testing building and tank in course of construction will provide facilities for testing very large pumps. The recent erection of a new office block has enabled the old offices to be used to double the floor area of the switchgear shop.

Mavor & Coulson's Works

Unless more mining men than we think take part in the I.E.E. visit to the works of Messrs. Mavor & Coulson, Ltd., we imagine that a good many of the visitors will be surprised to see the difference between designing and producing motors for general industrial use and the same work for special applications in the mining industry. There is no mass-production work in the generally accepted sense, while the limiting factor in design seemed to us during a recent visit to be the current-carrying capacity of the switchgear rather than considerations directly concerning the motor.

We refer in particular, of course, to coal-cutters, the electrical equipment of which must be treated in design as a unit complete with the switchgear. Indeed, it was most interesting to learn how the modern tendency to remove the starting switch from the coal-cutter housing for replacement in another form remotely at the gate end has considerably increased the capacity of the identical size and design of motor. We hope that the guests will be able to see an example of the company's most modern coal-cutter, the arc wall machine, a really ingenious piece of machinery of which, unfortunately, full advantage cannot be taken in the low coal seams of this country. There will be much of interest to be seen by way of shaker conveyors and loaders.

The Babcock and Wilcox Renfrew Works

In spite of the Clyde cruise which is to follow the visit to these works by the I.E.E. members, we believe that many will be disappointed in having to break away after a mere two hours in the works.

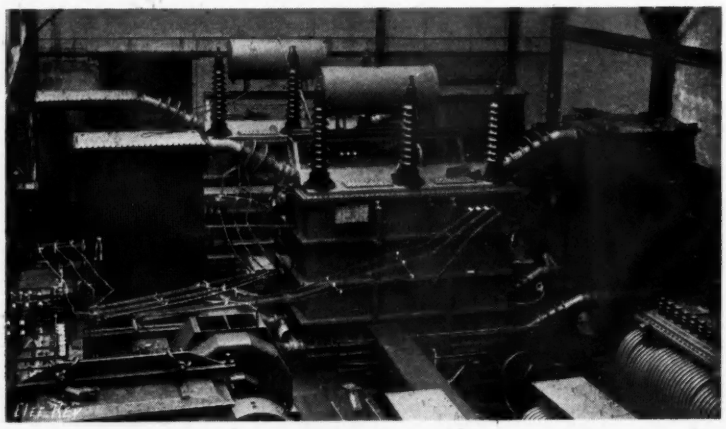
After a day in the works we find it a little difficult to point to those things which are likely to interest the visitors most. We are quite certain that the 33-ft. wide compartment travelling stoker under construction for the Klip station of the

The turbine room of the Portobello station

Victoria Falls Supply Co. is bound to interest the supply men.

The X-ray examination of fusion welding is worthy of note. A recent addition to the X-ray equipment is a machine which will penetrate 4¼-in. thick steel. Many h.p. boiler drums are welded throughout nowadays, and we recommend any interested visitors to see, if time permits, the ingenious manner in which welding defects are located and removed entirely

from any part of a weld. Every inch of welding that is effected is subjected to this X-ray examination. Should the large 8,000-ton hydraulic bending press, which will bend cold boiler plates up to 40 ft. long and 2¼ in. thick, be in operation, visitors will be lucky indeed. But then that applies to many other machines, such as the forging equipments, cold and hot pipe-bending gear, and particularly, we think, to the continuous moulding and casting plant, mainly for the production of stoker grate links, in the foundries.



Two 15,000-kVA transformers for the Central Electricity Board on test at the Bruce Peebles works

The Yarrow Shipyard

We have heard it said that those I.E.E. visitors who select the shipyard of Messrs. Yarrow & Co., Ltd., for their visit on Thursday next will be mainly interested in the boiler works. We are not so sure. However, as the company has just received the substantial contract for the supply of six large boilers to the Dalmarnock selected power station of the Glasgow Corporation, there is likely to be a special interest in that part of the works, although much headway will not have been made in actual construction. Each boiler will have a normal evaporation of 160,000 lb. of steam per hour and a maximum continuous overload of 200,000 lb. per hour. Steaming conditions will be 625 lb. per sq. in and 850 deg. F., and the boilers will be supplied complete with water walls, mechanical stokers, economisers, air heaters and forced- and induced-draught fans. The contract also includes foundations for the boiler-house building, coal- and ash-handling plant, and boiler-house piping. At about half a million sterling the contract is believed to be one of the biggest for boiler plant placed in this country in recent years.

Our recent visit to Yarrow's convinced us that the modern shipyard is the place to see the handling and treatment of steel plate on a really large scale. Much heavy work of this nature is done in the open yards, with individual electric machine drives. There is some first-class crane and overhead travelling equipment about the yards, too, including that over the shipbuilding berths, and a special feature of this is two 7-ton travelling cranes over the main yard on a gantry 600 ft. long with an 85-ft. span. Each traveller is equipped with motors as follows: 20 h.p. for hoisting, 20 h.p. for longitudinal travelling, and 10 h.p. for cross travelling.

Lewis's Polytechnic Stores

The one disappointment for the I.E.E. visitors to the new Argyle Street Stores, Glasgow, of Messrs. Lewis, Ltd., will be the absence of electrical space heating. But from lighting to internal broadcasting all other services are, in the main at any rate, electric. For lighting the company seems to have found an almost ideal combination of direct and indirect lighting compatible with essential utility, pleasing effect and colour-matching requirements. Three hundred kW of cooking equipment in the kitchen, in addition to a 48-kW double-tier baker's oven, is giving entire satisfaction from the points of view of economy, good cooking and easy maintenance. And we believe that the chef, who is a convert from non-electrical methods, might be persuaded to say how pleased he is with his lot nowadays.

Some gearless-drive, high-speed passenger lifts are an interesting feature, and there is a very impressive bank of motor generators, one per lift, with their control gear.

The cash-handling system with its four 35-h.p. Lamson suction turbines will, no doubt, attract a good deal of attention, particularly because of its automatic sequence operation.

Continuous casting plant in the B. & W. iron foundry

The main distribution scheme, embodying fifty-five l.v. iron-clad circuit-breakers made up as a continuous switchboard with enclosed bus-bars, should make a special appeal to the installation engineer and the contractor. The "oil-pump" method of arc control employed by these Brookhirst switches renders this equipment of particular interest, while the grouping of motor starters here and there on the continuous bus-bar principle will provide another source of attraction and perhaps discussion. All told in this store, which will eventually have a floor area of 42,067 sq. yd., there is a total of 500 h.p. of motors installed.

Messrs. Yarrow and Co.'s shipyard

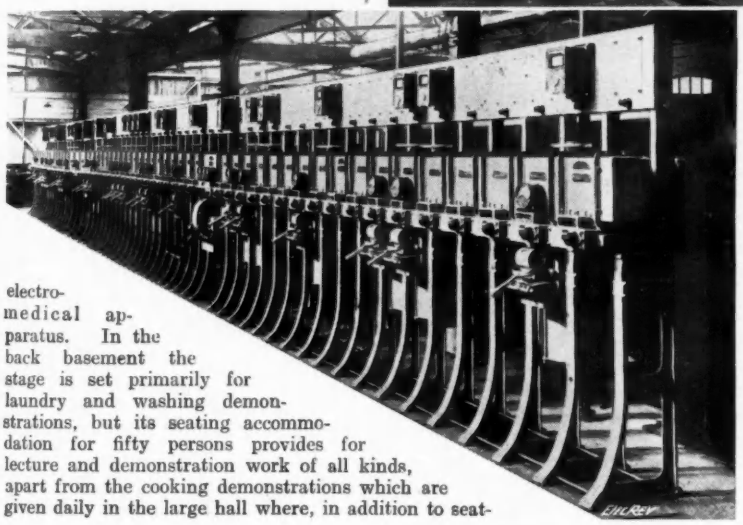
The Glasgow Showrooms

Although the Glasgow electricity undertaking is to play no part officially in the visits of the I.E.E. and the I.M.E.A., there is no doubt that during the "leisure hours" in Glasgow the excellent suite of showrooms in the city's "street of electricity" (Waterloo Street) will be a centre of attraction. In the spaciousness of that building recently we found that somewhat rare combination of luxury in architecture and utility. A keen

business atmosphere prevails and live load builders will enjoy talking to an enthusiastic staff.

Three main features are fundamental to the general showroom scheme. They are attractive lighting designed for campaigns to sell more light, a well-laid-out basement to assist in the sale of industrial power, and the provision of an exceptionally large demonstration hall.

Splendid examples of "luminous decorations" are to be found in the modern cove, cornice, beam and lay lighting, all of which are designed as part of the architectural scheme. A cubicle room is equipped with industrial and shop lighting fittings displayed in separate compartments. Modern ideas in domestic lighting are shown in well-furnished rooms, while separate apartments are devoted exclusively to the display of vacuum cleaners and various



Left: The 55-panel "oil-pump" circuit-breaker board at Lewis's stores, Glasgow. Above: The large demonstration hall in the Glasgow showrooms

electro-medical apparatus. In the back basement the stage is set primarily for laundry and washing demonstrations, but its seating accommodation for fifty persons provides for lecture and demonstration work of all kinds, apart from the cooking demonstrations which are given daily in the large hall where, in addition to seating accommodation for 100 persons there is ample room to walk round comfortably to inspect massed group displays of cookers, fires and refrigerators.

At the time of our visit we saw a class of girls receiving instruction in the operation of electric washing machines under the Juvenile Employment Scheme of education. Washing and ironing demonstrations are given by manufacturers about once a month, and the cooking demonstrations conducted by the undertaking are considered just as important for their ability to attract visitors to the showrooms to see other services which electricity offers as they are from the viewpoint of teaching "electrical" cooking. Perhaps the biggest load builder in the showrooms is a well-lighted shop-window in which Glasgow's shopkeepers are invited to display their goods.

The I.M.E.A. Convention

Summary of Events

THE chief proceedings at the I.M.E.A. Convention in Edinburgh next week are reviewed in our leading article. For reference purposes, however, the following summary of the programme will be useful.

Monday, June 8th.—10 a.m. to 1 p.m., and 2.30 to 8 p.m. Convention Office, Usher Hall. Issue of badges. 3 p.m. Waverley Market, Princes Street. Opening of the Electrical Exhibition by the Right Hon. Lord Salvesen (chairman, the Right Hon. L. S. Gumley, Lord Provost of Edinburgh). 8.30 p.m. to 1 a.m. Assembly Rooms, 54, George Street. President's reception and ball.

Tuesday, June 9th.—10 a.m. Usher Hall. Official opening of the Convention and civic welcome by the Lord Provost. Presidential address by Mr. E. Seddon, city electrical engineer and manager of Edinburgh, followed by a paper on "Electric Water Heating" by Mr. G. H. Lake, city electrical engineer of Nottingham. 2.30 p.m. and 3 p.m. Coaches leave for visits to Portobello power station and/or Messrs. Bruce Peebles Engineering Works. 8.30 p.m. to 1 a.m. Assembly Rooms. Lord Provosts's reception and ball.

Wednesday, June 10th.—Visit to the Rannoch and Tummel hydro-electric generating stations. A special train will take members to Pitlochry and from there motor coaches will convey the party to Kinloch Rannoch *via* some of the works of the Grampian Electric Supply Co. After lunch a visit will be paid to the Rannoch hydro-electric station, and after tea the return journey will be made from Pitlochry, the special train arriving back in Edinburgh at 9.50 p.m.

Thursday, June 11th.—10 a.m. Usher Hall. Paper on "Large Scale Electric Cooking" by Mr. W. E. Swale, of the Manchester Corporation Electricity Department and Mr. S. C. Hurry, of the Jackson Electric Stove Co., Ltd. 1 p.m. North British Station Hotel. Mr. E. E. Hoadley, past-president of the Association, will address the Edinburgh Rotary Club on "Modern Aspects of Electricity Supply." Assembly Rooms. Miss M. G. Cowan, O.B.E., will preside at a luncheon arranged by the Electrical Association for Women. 2.45 p.m. Usher Hall. A paper on "Electric Street Lighting," by Mr. P. J. Robinson, city electrical engineer of Liverpool, and Mr. J. N. Waite, city electrical engineer of Hull. 7 p.m. George Watson's College, Colinton Road. Annual banquet and ball, at which Sir Godfrey Collins, Secretary of State for Scotland, will be present.

Friday, June 12th.—9.30 a.m. Usher Hall. Council meeting. 10.30 a.m. Annual general meeting. The agenda includes a resolution referring to the forty-hour week. 2.30 p.m. Visit to Queensferry (Forth Bridge) and Lauriston Castle.

Delegates staying on until Saturday will be free to visit the many places of interest in Edinburgh. These include Edinburgh Castle, Huntly House (Canongate), Holyrood Palace, Lady Stair's House (Lawnmarket), St. Giles's Cathedral (High Street), Royal Scottish Museum (Chambers Street), National Museum of Antiquities (Queen Street), Zoological Park, Royal Botanic Gardens (Inverleith Row), Scott Monument (Prince's Street), and the National Gallery of Scotland (Mound, Prince's Street).

The I.M.E.A. Council's headquarters is at the Caledonian (L.M.S. Railway) Hotel. Delegates may park their cars free of charge at Castle Terrace (North side) if a special label, to be obtained at the Convention Office, is affixed.

Radio Examinations

All candidates desirous of taking the A.M.I.W.T. examination in November must submit their application not later than June 30th, 1936. No further applications can be accepted from overseas candidates for the examination, but applications to take it in May, 1937, will be accepted up to November 30th, 1936. Applications in respect of the associateship examination in November will be accepted up to September 30th next, and overseas candidates must lodge their applications two months prior to this date. Applications must be submitted on Form "E." to be obtained from the Secretary, Institute of Wireless Technology, 4, Vernon Place, Southampton Row, London, W.C.1.

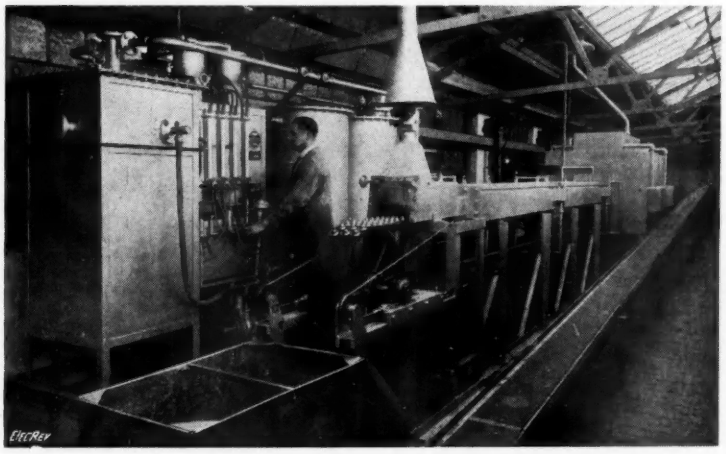
Electric Brazing.

By A. G. Robiette, B.Sc.

The influence of the continuous furnace process

CONTINUOUS electric furnace brazing in controlled atmospheres is now being introduced industrially on a fairly large scale. It has been called "hydrogen" and "copper" brazing, but since neither hydrogen nor copper are essential to the process electric furnace brazing seems a more applicable term. In principle the process is simple. What has required considerable development and research work is the rather special plant upon which the success of the method depends. The two articles or components to be joined are first of all made to fit reasonably well, the clearance being of the order of 0.001 to 0.003 in.; then a ring of copper or other brazing alloy wire is placed in close proximity to the joint.

The whole assembly is next passed into an electric furnace with a controlled atmosphere and held at a temperature slightly above the melting point of the brazing alloy. The electric furnace is abutted by a cooling chamber through which gas circulates so that the parts are cooled in the same atmosphere as that in which they are heated. The finished brazed parts are then discharged perfectly bright and clean and at a temperature at which they will not discolour.



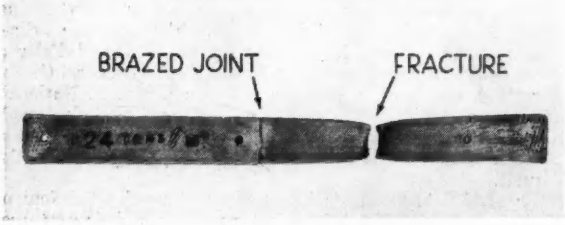
Continuous conveyor type furnace (Birmingham Electric Furnaces, Ltd.), showing the gas generating plants on the left

There are many variations of the above procedure; for instance, the copper or other brazing alloy may be of thin strip, if more convenient, or in the form of powder made up into a paste and applied to the joint with a brush.

An assembly can embody several joints which can all be made at the same time. The copper or other brazing alloy, when molten, flows into the clearance, if this is within the limits stipulated, by surface tension or capillarity. Flux is not normally used. If the parts are not quite clean on entering the furnace the atmosphere will (by reducing the oxide) serve as the flux. The parts are generally located by making them a press or push fit, but if this is not possible spot welding is often employed or a simple form of jig can be used.

Applicable to Many Operations

The process has enormous possibilities for the production brazing of assemblies by a continuous process which leaves nothing to the personal element. Besides being applicable to many operations at present conducted by dipping or with the blow pipe, it is rapidly supplanting other methods of fabrication. For instance, instead of machining a complicated part from the solid it is often possible to build it up from a number of components such as stampings, pressings or small machined parts brazed together. What is more remarkable is that when the parts are of mild steel and a properly designed brazed assembly is made, the completed piece is actually stronger than if it were solid. This is due to the fact that if the components are a good fit the clearance is filled with a copper-iron alloy.



Copper brazed tensile test-piece that fractured under stress at a point remote from the joint

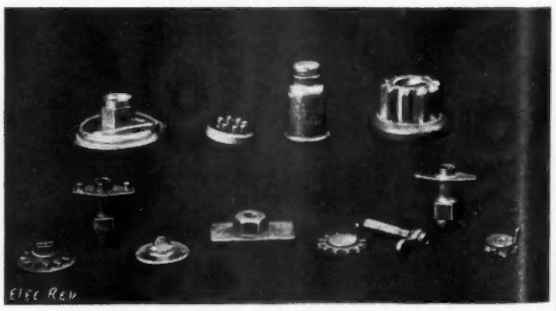
The test piece illustrated was made of two pieces of mild steel strip butt-brazed where shown. They were passed through a continuous furnace on a plate with a piece of copper between them and with no applied pressure. It will be seen that the test piece fractured at 24 tons per square inch at a point quite remote from the joint.

Only the minimum of brazing alloy is required (just sufficient to fill the clearance at the joint) with the result that no subsequent cleaning operations are necessary to remove excess brazing alloy. The parts can also be subjected to heat-treatment after brazing, such as hardening, cyaniding, or carburising, if this is required. The process is particularly applicable to parts which have to be pressure or vacuum tight.

In many cases the process is very much cheaper to operate than other joining methods including riveting, welding, and soldering, especially for complicated components where a multiplicity of joints are required in a single assembly. As a very approximate idea of the cost of the operation, 100 lb. of small parts can be brazed continuously at a cost of 4s. including labour, electricity, producer gas and maintenance charges on the furnace.

Up to the present the process has found its widest application to steel parts employing brass or copper as the brazing medium. Recent work, however, has shown that it has possibilities for non-ferrous metals such as brass and nickel alloys. In this latter case silver solders have been mostly used as the brazing medium.

Some applications which are of interest to the electrical industry include the fabrication of fan pulleys for dynamos from a number of pressings, the brazing of tungsten contacts for coil-ignition systems, the building up of pinions, electrical refrigerator parts, cams for various purposes, the tipping of tools with tungsten carbide inserts, and the fabrication of metallic wireless valves. The parts without being treated or cleaned in any way after brazing are perfectly clean and bright.



Group of parts that have been brazed in an electric furnace

The plant required for the process resolves itself into two parts, namely, the special controlled atmosphere furnace, and the atmosphere generator, or gas plant. The furnace is heated by nickel-chromium resistor elements and is made gas-tight except at its ends. Adjoining the furnace is a gas-tight, water-cooled chamber which is normally longer than the heating zone. In the continuous type of furnace the work is conveyed through the furnace on a wire-mesh belt or on trays or shoes propelled by an external pusher gear. The conveyor type is the one mostly favoured owing to its simplicity and convenience in operation. The wire mesh belt is of special design and constructed of a special alloy to withstand the maximum temperature, which is in the region of 1,130 deg. C. for copper brazing. The design of the heating elements is also particularly important in this type of furnace since the temperature of operation is at the upper limit of that obtainable with nickel-chromium alloys. The gas is passed into the furnace and cooling chambers and thus envelops the work from the time it enters the furnace. The gas flows outwards at the end of the furnace. Small furnaces can be of the hand-operated type with the work charged on trays and pushed manually

through heating and cooling zones. This design of plant is useful for a small output of miscellaneous parts.

The protective atmosphere usually employed is derived from coal gas partially burned and treated in a special plant to remove sooty compounds and sulphur. It is especially important to remove the latter impurity since it greatly affects the life of the furnace parts and much research work has been done on this subject. The cost of this atmosphere on an appreciable size of furnace is only a few pence per hour and is negligible when it is compared with the output of work.

Although the process is well out of its development stage, the first steps towards its introduction must be made in the design department, since there are numerous parts fabricated by other means which could with advantage be made by this method. It has the following virtues to commend it: A clean article is produced; the system is continuous and automatic in operation, cheap to run, and produces no distortion or changes in length.

The I.E.E. Council Nominations

LAST week the Council of the Institution of Electrical Engineers announced its nominations for the offices which fall vacant at the close of the Institution's year, September 30th.

Mr. H. T. Young has been selected for the position of president. Mr. Young is governing director of Troughton & Young, Ltd., Knightsbridge, London, S.W., contractors and engineers. His company has been responsible for the installation of equipment in many well-known buildings throughout the country. He has been associated with the present company for over twenty-five years, having occupied the positions of employé, junior partner and proprietor previous to its being converted into a limited company. He received his early practical training with Messrs. Rawlings Bros., London, prior to joining his present firm, and his technical training at the South Western Polytechnic.

Paul Tanqueray

Mr. H. T. Young

He has served the electrical industry on many committees and councils, commencing many years ago with the London Committee of the E.C.A., of which he was chairman in 1923-24. He first served the I.E.E. as a member of the Informal Meetings Committee; he was elected to the Council for the years 1927-30 and served as a vice-president for the years 1932-35. He represented the I.E.E. on the E.D.A. Council for five years, and is still chairman of the E.D.A. Liaison Committee with the Building Centre. He has served on most of the I.E.E. internal committees, and has taken a special interest in the Students' Section. He represents the I.E.E. on other bodies, particularly in connection with buildings and architecture. He was for three years a member of the council of the Illuminating Engineering Society, and received the first award of the Leon Gaster Premium.

Apart from his ordinary work, Mr. Young is specially interested in the improvement of design of domestic electrical equipment.

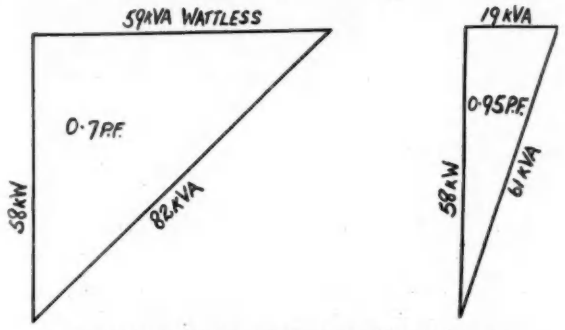
Mr. Johnstone Wright, who is chief engineer to the Central Electricity Board, has been nominated as vice-president. He was formerly city electrical engineer of Belfast, and before that was with the Bradford undertaking and the North-East Coast companies.

Mr. F. W. Crawter is renominated for the post of honorary treasurer, and the following gentlemen have been put forward for election as ordinary members of Council:—Members: **Mr. T. Carter** (Messrs. A. Reyrolle & Co., Ltd.); **Mr. H. J. Cash** (managing director of Messrs. H. J. Cash & Co., Ltd.); **Mr. C. E. Fairburn, M.A.** (electrical engineer to the London, Midland & Scottish Railway Co.); **Mr. F. Forrest** (chief engineer and manager, Birmingham Corporation Electric Supply Department); and **Mr. S. W. Melsom** (technical officer, Cable Makers' Association). Associate member: **Mr. C. R. Westlake** (borough electrical engineer and manager, Finchley). Associate: **Mr. E. M. Lee** (director and general manager, Messrs. Belling & Lee, Ltd.). Nominations for the vacancies by members of the Institution must be made by June 21st.

Power-factor Correction. By K. D. Weguelin

A quick method of ascertaining the duty of condensers

WHERE static condensers are installed for power-factor correction it is beneficial to a supply undertaking if one unit is fitted to each motor of 5 h.p. and over and one of greater capacity at the service terminals, for the following reasons: (1) When a motor is shut down its condenser is disconnected automatically, thereby avoiding more reactive kVA being connected than necessary (the operating losses are in the region of 2 W per kVA of reactive output). (2) All condensers will be disconnected when the works are shut down, thereby obviating wattless kVA (leading) that might occur on the supply system if one large condenser were inadvertently left connected across the mains at the service position. (3) The condensers will be connected when their motors are in operation. If one large condenser is installed and is not switched in the consumer will obtain the benefit of the rebate without carrying out correction. (4) The condenser discharges through the stator windings of the motor when shut down, so that discharge resistances are not necessary.



Power-factor without (left) and with condenser

In order to calculate the condenser reactive kVA required to improve the power-factor the existing power-factor and the load in kVA or kW must be known.

The first can be determined from the kW load and total current. The load can be calculated from the undertaking's kWh meter by ascertaining by means of a stop watch the time taken for, say, five revolutions of the disc.

For example, the plant of a works consists of three motors of 50, 30 and 25 h.p., driving shafting, running off a 400-V, three-phase, 50-cycle system. Five revolutions of the disc take 25 sec., and the meter factor =1 kWh at 12.5 revolutions of the disc. Then $kW=(5\times60\times60)/(12.5\times25)=57.6$; say 58 kW. The total current (obtained by means of tong-type ammeter)=118 A. Therefore, $kVA=118\times400\times1.73=81.656$; say, 82 kVA.

Power factor $=kW/kVA=58/82=0.7$.

To improve the power-factor from 0.7 to 0.95, as the wattless load=kW×tan ϕ of the angle of lag, the reactive kVA (tan ϕ) per kW at 0.7 power-factor being 1.020 and at 0.95 0.329, the leading kVA of condenser required $=58\times(1.020-0.329)=40$ kVA (approximately).

New E.A.W. Branch at Brighton

The seventy-first branch of the Electrical Association for Women was inaugurated at Electric House, Brighton, recently, over one hundred people attending. The chair was taken by Alderman Miss Margaret Hardy, and the speakers included Miss Caroline Haslett, director of the Association, Miss Boulton, president of the Sussex and Kent Association for Teachers of Domestic Science, and Mr. W. N. C. Clinch, borough electrical engineer. Alderman Miss Margaret Hardy was elected chairman and Miss W. Graystone hon. secretary.

The Royal Society Conversazione

Some interesting exhibits

AMONG the scientific exhibits displayed at the annual conversazione of the Royal Society (president: Sir William Bragg) at Burlington House on May 28th, the Research Department, Woolwich (Directorate of Radiological Research) demonstrated a modified method of detecting flaws in metals with the aid of portable apparatus consisting of a variable frequency generator and search and balance units, with a detector and recorder. An alternating electro-magnet is made to traverse (search) the specimen under examination, eddy currents being thereby produced in the vicinity of the search unit. This effect is demagnetising and is diminished on passing over a flaw, the usual current balance being disturbed to an extent roughly proportional to the size of the flaw.

The National Physical Laboratory illustrated the principles of the electric balances employed in wind tunnels in positions difficult of access for direct comparison. Force is measured by a Kelvin current balance; a special form of inductance bridge is used for indicating the attainment of equilibrium, and an electro-magnetic device is incorporated to enable the stability of the balance to be altered at will. Noise abatement in houses was demonstrated by models, including the stilling of the vibration of a motor by a long-period spring support.

" Hearing " Temperatures

Prof. J. W. Munro and Mr. E. C. Stanley had an aural electrolytic thermometer with a note-matching device. The resistance of an electrolyte in a special capillary changes with temperature, and so does a note heard in headphones. This note is balanced with a standard note, which is compensated for temperature and voltage variation and initially checked against a tuning fork. A dry battery supplies the power.

Standard Telephones & Cables, Ltd., exhibited the " Sunbury " cathode-ray indicator for internal-combustion engines, operated by a 12-V battery. Dr. M. B. Lewis claims that his " scale of two " recorder of disintegration particles (radioactive and transmutation) is cheaper and more reliable than the Wynn-Williams thyratron arrangement. The new element is a " flip-flop " valve triggering circuit employing two " Westector " metal rectifiers and an inductance. In association with a suitable ionisation chamber and amplifier it is capable of counting at rates up to 6,000 per minute, *i.e.*, separate particles arriving only 1/5,000 second apart.

Dr. C. R. Cosens showed cathode-ray oscillographs mounted on wheeled trolleys and operated from a.c. mains, primarily intended as an audio-frequency workshop tool. Versatility is attained by bringing all connections to external terminals, removable straps making normal connections for routine measurements convenient and rapid. One outfit was fitted with a device employing gasfilled triodes by which two waves are delineated on alternate strokes of the time base, appearing simultaneously on the screen by the persistence of vision.

The Admiralty, Department of Scientific Research and Experiment, showed a new type of magnetic force inductor consisting of a " Mumetal " rod in the centre of a coil of wire connected to a ballistic galvanometer. When the rod is withdrawn the galvanometer kick enables the magnetic field strength to be calculated.

A Recording Magnetometer

A new recording magnetometer depends on the impedance of a wire of high permeability being affected by change in the axial component of the magnetic field in the wire. Three nickel-iron wires, fixed mutually at right angles, are used to measure the earth's magnetic field components. Each can be placed in one arm of an a.c. bridge, fed with 40 mA at 500 cycles. The bridge is normally balanced, the detector arm consisting of a rectifier system capable of showing right- or left-hand deflection for positive or negative changes of impedance of the magnetometer wire.

A vibration galvanometer working on the Wiedemann effect consists of a vertical wire of nickel-iron alloy fixed at both ends and having a " bob " and mirror at the centre. The wire is fed with 500 mA d.c. and a coil with 50 cycle a.c. The circular field due to the former, combined with the longitudinal field of the latter, causes helical magnetisation and consequently alternating twist. The length of the wire as well as the moment of inertia of the " bob " can be varied for tuning and resonance.

St. Bartholomew's Hospital (Physics Dept.: Prof. F. L. Hopwood and staff) has developed an instrument for searching for lost radium containers. It consists of a neon lamp in series with a high resistance and shunted by a condenser. When the correct voltage is applied the liberation of a single electron causes the condenser to discharge, which can be heard in earphones. Dr. D. Robertson exhibited the " Cossor " cathode-ray electro-cardiograph with a fluorescent screen having a very long after-glow so that the cardiogram may be viewed directly.

Prof. H. Hartridge and Messrs. C. S. Hallpike and A. F. Rawdon-Smith have devised a pure-tone photo-acoustic siren. A motor-driven disc has 96 equidistant radial slots cut in it; a light ray is passed through these slots on to a photo-cell, so varying the voltage which is amplified and passed to a cathode-ray tube or loud speaker. Variation of the light-ray focusing point alters the wave form of the electrical output, which can thus be made to approximate to a pure sine wave.

Mr. M. T. Astbury's study of protein structure by means of X-ray diffraction photographs illustrated, among other things, the electrical orientation of wool cells and fibrous proteins. Mr. G. A. Millikan showed how the oxygen content of small quantities of blood can be measured photo-electrically, since reduced hæmoglobin absorbs light much more strongly than does oxyhæmoglobin.

The General Electric Co., Ltd., displayed a model to illustrate the working of a cathode-ray tube in a television receiver, for lecture purposes. Also recent work on luminescent materials was indicated with possible applications to light-colour correction. Dr. D. Shoenberg had a small lead sphere suspended from a torsion balance in an inhomogeneous magnetic field. While the lead is cooled by liquid helium it is supraconductive; no lines of force can enter it and the torsion balance registers a " diamagnetic " force which increases with the square of the field. When the field is increased to two-thirds of the " critical value " it begins to enter the sphere, and further increase reduces the deflection of the balance until at the critical field it is zero, when the ball is no longer supraconductive. If the field is now again reduced, the Meissner effect is shown, the lines of force are pushed out of the sphere, and the force retraces its original course, contrary to the old idea of persisting currents.

Sir Robert Robertson and Drs. J. J. Fox and A. E. Martin have devised an automatic pen recorder for infra-red spectra to avoid tedious visual observation of a galvanometer mirror. Current from a photo-electric cell is amplified and made to actuate a pen, whereby the change in the intensity of the infra-red radiation on passing through an absorbing medium is recorded on a rotating drum directly, thus dispensing with photographic methods.

Measuring Surface Temperatures

Dr. F. P. Bowden showed how the surface temperature of sliding metals can be measured by using the rubbing contact of two different metals as a thermo-couple; apparently surface melting occurs, though the mass remains cool. The Cambridge Instrument Co., Ltd., has made an instantaneous recording optical pyrometer that focuses an image of the hot body on to a shutter in front of a photo-cell connected to a mirror-galvanometer coil. When a temperature is to be measured, a motor-driven controller opens the shutter for a short period (about 0.5 second), thus deflecting the galvanometer, the displacement during the time the shutter is open being a measure of the current and a function of the temperature. By means of an optical system incorporating a relay galvanometer, controlled by a photo-cell and a thermionic valve, the deflection is translated into a current which can be recorded or indicated.

Dr. H. S. Hatfield's " Cambridge " a.c. electrolytic resistance meter is compensated for temperature by a special transformer whose secondary winding is carried on a moving member controlled by a bimetallic device. This, with the electrode system, is immersed in the liquid to be tested and causes the transformer output to vary inversely as the electrolytic resistance. Thus, the resistance measurement is automatically corrected for temperature. The Psychological Laboratory, Cambridge, showed an electro-magnetic æsthesiometer for measuring sensitivity to touch and pain stimuli.

The British Thomson-Houston Co., Ltd., exhibited a special discharge lamp designed to produce periodic flashes of high intensity and of extremely short duration for the stroboscopic examination of moving mechanisms.

The fluorescence of various materials when excited by 3,650 A° radiation obtained from mercury-vapour discharge lamps was demonstrated. Also the spectrum of an ultra-violet lamp at 40 atmospheres pressure was projected on to a screen for contrasting with the spectrum at one atmosphere pressure, to indicate the broadening of the lines and the continuous background in the high-pressure spectrum.

The Blackburn network calculator which was exhibited by Messrs. Merz & McLellan is referred to in more detail on page 822.

New Switchgear at Wolverhampton

Rupturing Capacity 500,000 kVA

THE maximum short-circuit value which the main 6.6-kV switchgear at the Commercial Road station of Wolverhampton Corporation could be called upon to rupture has increased since 1932 from 250,000 to 500,000 kVA. The difference is due mainly to additional generating plant at Ironbridge power station (West Midlands J.E.A.) and to linking up with the grid. As the existing switchroom could not accommodate the larger units required, a new switch-house was built, and this was opened on May 28th by Councillor H. Southan, chairman of the Electricity Committee.

The switchgear section is divided into two rooms each 60 ft. long and containing two banks of metal-clad circuit-breakers with duplicate bus-bars and coupling switches. Each of the four sections includes a panel for receiving the 6.6-kV supply from the West Midlands J.E.A. and other panels for the control of outgoing feeders, to a total of forty units. The oil circuit-breaker comprises a vented top plate carrying the operating link, fixed and moving contacts and isolating plugs and oil tank. It is solenoid operated from the control room; free-handle trip mechanism is provided in conjunction with the operating link. The fixed contacts are of the controller-finger self-cleaning pattern arranged in pairs, and the moving contacts are copper wedges. The welded-steel tanks are separated into three compartments by steel plates. Isolation is effected with the aid of a motor-driven hydraulic hoist, which is inserted under the breaker. Bus-bars of tubular form are supported in cast-silicon aluminium chambers by bakelite plates and by bushes in the ends of each section. Current transformers are housed between the circuit-breaker and cable box and potential transformers in rolled-steel tanks secured to the rear framework.

The main control room is separated from the switch-house. It contains a control board divided into panels each containing a control switch and instruments for one 6.6-kV circuit-breaker.

All fine wiring interconnecting the apparatus on the black enamelled front of polished slate is carried out inside the cubicles, to which access is gained from the back. A mimic diagram, representing the main high-voltage connections of each unit, is arranged on the front of the board. These connections are made with chromium-plated brass strip in which electrically operated discs are inserted to indicate whether the breakers are open or closed. Protective-type current transformers mounted on the switch unit are interconnected with relays on the control board, the main types being overload and earth leakage and split conductor. In the control room are also the summation panels for registering the incoming power and the outgoing traction supply; they are similar in construction to the control switchboard.

The increase of the short-circuit kVA at Commercial Road was reflected in the conditions at 160 sub-stations, which necessitated the reconstruction or replacement of some 220 switches. After moving the older switchgear from Commercial Road into sub-stations, where the maximum short-circuit value was within 250,000 kVA and modifying and rearranging that in the more remote sub-stations, it was necessary to purchase only eleven switch cubicles beyond the forty required for the main distribution centre. The total scheme was estimated to cost £76,000, and actually cost three per cent. less.

Wolverhampton's share in encouraging the growth of load which has contributed to the need for the work described above is seen in an increased output of almost eighty per cent. in the last five years, which makes the undertaking one of the first twelve municipalities in respect of the number of kWh sold per annum. While one of the chief aims of Wolverhampton Corporation has always been to provide cheap electricity for industry—and eighty per cent. of the load is power—progress has also been greatly assisted by schemes for assisted wiring and rural development (described in the ELECTRICAL REVIEW of October 7th, 1932) which were inaugurated by Mr. T. A. Margery on his appointment as borough electrical engineer and manager in 1930. Some 12,000 premises take advantage of the assisted-wiring scheme, and a supply is provided in all townships and villages in an area of over 106 sq. miles.

The present value of the Wolverhampton undertaking is £1,500,000, to which it has grown since its starting up in 1895 by Lord Kelvin, when the capital expenditure was £26,000 and the area of supply was 5.5 sq. miles. In 1913 the area was extended to 11 sq. miles, and in 1925 to 47 sq. miles, the territory being increased to its present dimensions in 1932. With a view to reducing costs of generation the power station was sold to the West Midlands Joint Electricity Authority in 1926. The continual growth of load and extensions of mains made it necessary to change over from d.c. to a standard a.c. three-phase four-wire system of distribution. This work was completed in 1933, in which year the scheme of laying cables in all built-up streets was carried to a conclusion.

The main control board and (bottom) one of the bays of metal-clad switchgear

The contractors responsible for the present extensions were Wilson, Lovatt & Co., Ltd. (buildings); the General Electric Co., Ltd. (metal-clad switchgear); Callender's Cable & Construction Co., Ltd. (cables); Herbert Morris, Ltd. (cranes); Acme Flooring & Paving Co. (1930), Ltd. (control room floor); H. L. Tucker (switch-house floor).

Fire Protection in Remote-controlled Power Stations

According to the *Asea Jornal*, the house organ of the Swedish General Electric Co., a series of regulations relative to the protection of remote-controlled power stations has recently been issued by the Advisory Committee of the fire insurance companies in Sweden. They contain, among others, the following provisions: Electric generating stations which are not operated under continuous personal supervision by a staff shall be provided with automatic arrangements which, in the event of breakdown of the normal control apparatus, will effectively prevent the attainment of such temperatures in bearings, oil, or electric windings as can give rise to fire, external to the machine or apparatus in which they occur; a sustained alteration of the voltage generated by the equipment in the station sufficient to cause the voltage supplied to any user connected to the system to rise more than 10 per cent. above the normal value; and a sustained increase in the speed of the generators supplying an alternating current system which will cause the frequency to rise more than 5 per cent. above the normal value.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Institution Membership

It would appear from the letter of your correspondent "Sine of an Arc" that the effect of the membership policy of the Institution of Electrical Engineers is to retard individual progress. This I know from experience is certainly the case in regard to the promotion of lower grades.

I joined the Institution as a student in 1919 and passed the associate membership examination in 1926. An immediate application for transfer was rejected, probably justifiably, on grounds of "insufficient responsibility." In 1933, having three years previously changed my job for one of greater responsibility, a further application was rejected because "the qualifications submitted do not . . . . satisfy the requirements of the proposed transfer."

I am constantly meeting people who proudly use the qualification A.M.I.E.E., but who admit that they have not passed any examination; neither do they hold any exempting qualification. Others, like myself, express extreme dissatisfaction with the discouraging attitude adopted by the Institution in regard to the promotion of junior grades. L. MORGAN SMITH.

Banstead, *May 29th.*

Water-heater Faults

In my position as a service engineer to a supply company, I have frequently been called upon to attend to non-pressure water-heaters which have been wrongly installed.

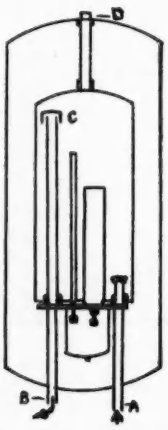


Diagram of a non-pressure type water-heater

I believe that a short study of the working principles of these heaters does much to clear the mystery with which they are at present surrounded. In the accompanying diagram, the main cold water supply is connected at A and the hot water flows out at B. To avoid constant dripping at B a cap is fitted to the outlet pipe at C. Provision is made at D for the release of any extra steam or pressure of water. The relationship of the pressure of the water supply to the rate of flow of hot water must be predetermined and kept constant. Variation of this relationship is the cause of practically all the trouble with these heaters.

To overcome the variation in the pressure of water supplies, manufacturers supply a selection of restriction washers and the most suitable one should be fitted when the heater is installed. Care should be taken to avoid any restriction of the flow of hot water by the addition of any part not recommended by the makers, such as anti-splash devices or extra lengths of piping. If the heater cannot be installed directly above where hot water is required, a pressure-type heater should be fitted.

When the heater has been installed for some time, furring may take place at the point C, which has the effect of restricting the flow of hot water. As the pressure is the same the water finds an outlet at D. This can be avoided by periodically removing the heating unit, which is a simple operation, and cleaning away any signs of fur.

To remove the heating unit, both water connections must be disconnected; this will allow the tank to empty. Then remove the bottom cover and take out the bolts holding the heating unit. If it is difficult to remove, drilled and tapped holes are provided into which bolts can be screwed to force the unit out. Before replacing, both surfaces should be cleaned and a new washer fitted.

Briefly, the main faults are: (1) water leaking at the outlet D, due to wrong size restriction washer, restriction of hot-water flow, or furring at C; and (2) spasmodic flow of hot water, due to wrong size restriction washer, or pressure of supply too low.

I believe that a frank discussion of troubles found with electrical equipment supplied to the public would do much towards encouraging their ultimate use. E. S. WESTAWAY.

London, N.13. *June 1st.*

Anonymous Advertisers

I think I shall be expressing the feelings of a great many in protesting strongly against the unnecessary use of box numbers in your "Situations Vacant" columns. There are occasions no doubt when a box number is advisable; in any case I am not attacking the journal—the advertiser pays the piper and therefore calls the tune.

The issue I have in front of me contains forty-four "vacancies" apart from the municipal jobs. Of these forty-four only nine give the name of the company, and out of the remainder less than half give any idea of the district even broadly such as "Midlands." Three are more helpful, two giving "London" and one "Manchester."

Recently I answered several box number advertisements and after a considerable waste of time went a step further and obtained interviews. Fully qualified engineers were required to take over preparation of tenders for large complete schemes, a.c. and d.c. Those fully in touch with large complete schemes, particularly electrical companies, will not need to be told of what a senior estimator has to be capable—apart from the facts that there is no department which is more rushed, or whose mistakes are attended with more dire results.

Only an experienced and thoroughly trained man could be engaged. Anyone "listening in" to my interviews would have gathered that a £1,000 per annum man was being sought. I was eventually expected to travel to the opposite end of the country for £3 15s. per week in the one case, and (after great efforts) £4 per week in the other case. This after ten years' experience in the work and a training that must have cost my parents a very large sum. RESPONDER.

May 29th.

Selling Ice-cream Automatically

THE selling of ice-cream by means of automatic machines appears likely to become popular this season. At Bournemouth last year when several experimental machines were tried out one alone took over £300 in fifty consecutive days, an average of over £6 a day. An astonishing feature was that one-third of the money was taken between 11 p.m. and 8 a.m.

A standardised model equipped with a compressor driven by a ¼-h.p. motor is now being made by the Metropolitan-Vickers Electrical Co., Ltd., and marketed by Icematic, Ltd., 423, Coastal Chambers, 172, Buckingham Palace Road, S.W.1. The machine can be refrigerated with dry ice.

Upon the insertion of two pennies a full-sized cup of ice-cream and a wooden spoon are delivered. The cups are stacked in tubes in the insulated refrigerated container, and an ingenious and patented lift mechanism takes a cup from the bottom of the pile, raises it to the top, and drops it down a chute to the delivery platform. This is an important feature since, if a refrigerated machine is made on the same principle as an ordinary slot machine, not only is a quantity of the coldest air lost each time the drawer is pulled, but the warm air which flows in would immediately deposit its moisture on the mechanism in the form of frost, causing it to seize up.

A somewhat similarly designed machine, delivering both penny and twopenny ices, is also available from Century Refrigeration, Ltd., Brent Crescent, London, N.W.10.

Ice-cream manufacturers are likely to welcome the machines since they are claimed to sell the ice-cream at nearly double the profit resulting from the sale by means of a man on a tricycle.

The Icematic and Century Refrigeration automatic ice-cream vending machines

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Electrical Refrigerators

Newcomers to the refrigerator market are SAVOY REFRIGERATORS, LTD., Dukes Avenue, Chiswick, W.4, who are manufacturing a range fitted with Delco-Remy and Hyatt motors driving a compressor which runs at 420 r.p.m.

The " V4 " table-top refrigerator

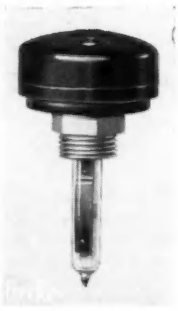
The smallest size has a food storage space of 3 cu. ft. and a shelf area of 5 sq. ft. with the compressor beneath the cabinet. The " V4," a 4 cu. ft. model with 9¼ sq. ft. of shelf area, is made both as an upright model and as a table-top type. The corners are curved, giving the refrigerator a pleasing appearance and minimising the collection of dust. Internally, white vitreous porcelain is used, and the corners are rounded to facilitate cleaning. Adjustable and removable shelves are fitted, while the evaporator has three ice trays giving 63 ice cubes. Two of these can be removed, with the intervening shelf, to accommodate a dish for ice-cream or frozen sweets. Six-point cold control is provided, with a defrosting position. The " Twin V4 " comprises two vertical " V4 " models, side by side, built up as one unit but with separate doors and food compartments.

An external finish of white stoved lacquer, with chromium-plated hardware, is standard for all models which, we are informed, are being sold in the City by the Sloan Electrical Co., Ltd., Fetter Lane, E.C.4.

A Thermal Alarm

A thermal alarm for bearings, transformer tanks, oil lines, &c., has been developed by SUN-VIC CONTROLS, LTD., 1, Kingsway, London, W.C.2.

The temperature sensitive device is a standard " Sun-Vic " vacuum thermostat arranged to make contact at a certain temperature. All air, moisture and dirt are excluded from the contacts, and they consequently remain clean and free to operate after long intervals. The contacts can carry up to 0.5 A at 250 V, so that the alarm can be used for operating bells, lights, &c.



The " Sun-Vic " thermal alarm

The thermostat is mounted in a screwed fitting which carries a bakelite terminal housing. The overall length of the unit is 4½ in., and it is therefore sufficiently small to be accommodated conveniently in many types of apparatus. Where temperature protection is required at various points, a number of alarms may be used with their special lamps localised on one panel.

In conjunction with a vacuum switch the alarm may be used to operate a trip coil or other protective gear to shut down plant in the event of excessive temperature being reached.

Novel Table Standards

China figures of children and animals form attractive centre-pieces for a novel range of table-lamp standards made by ALADDIN INDUSTRIES, LTD., Aladdin Building, Greenford, Middlesex. The shades, which bear floral or animal designs, are made of " Whipolite," a specially treated paper providing an exceptionally soft light.

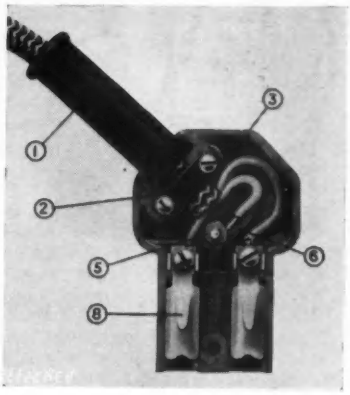
Another interesting series of table lamps employs amusing figures of sportsmen, such as golfers and hockey-players, the light being focused on them by means of cylindrical shades.

An Improved " Magnet Minor " Electric Cooker

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has recently replaced its " Minor " cooker by a new and more attractive model incorporating many practical improvements. It can provide for households of up to four persons, and is fitted with a separate 8 in. hot-plate (1,800 or 2,250 W). The net cooking space of the oven (now lagged) has been enlarged to 11 in. wide by 12 in. deep and 10 in. high. The total maximum loading is 3,350 W. The oven shelf runners are built in, while a large grill fitted within the oven measuring 9 in. by 8 in. is provided by the top oven element.

An Improved Connector

The improved " Ormond " connector (ORMOND ENGINEERING CO., LTD., Rosebery Avenue, London, E.C.1) embodies several special features. The rubber guard (1), which fits into a recess (7) in the moulding, is arranged at an angle of 45 deg. to the bakelite connector. A cord grip (2), adjustable by means of two screws, enables all types of flexible to be held tightly, ample space (3) being provided to simplify connection.



The new " Ormond " connector

An external sprung earthing terminal (5) is provided, and insulated barriers (6) are situated between the conductors. The contacts (8) are of a special shape with tensioning tongues to ensure a good connection with plugs of normal size.

Wattmeters for Domestic Electrical Appliances

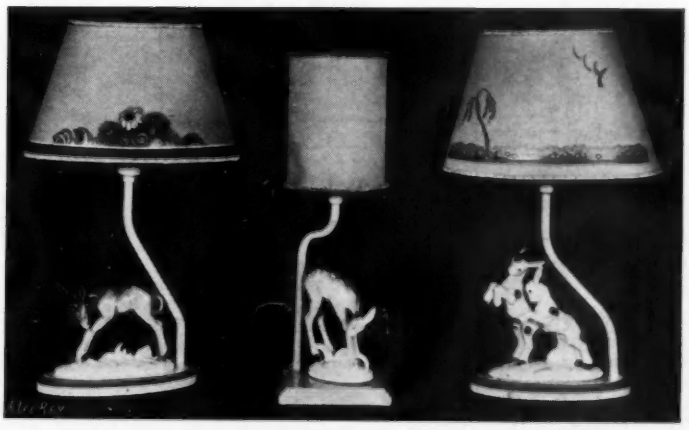
A wattmeter indicating up to 180 W has recently been put on the market by the NORA RADIO GESELLSCHAFT, Charlottenburg. For measuring up to 1,800 W another model has been introduced for use with cookers, vacuum cleaners, &c. The instruments are of the induction type with horizontal measuring disc, the maximum rating of the small model being 2.2 A and of the large one 150 A. A fuse is incorporated.

A Capacity-operated Switch

A device, supplied by the CORPATACT SYNDICATE, 12, Whitehall, London, S.W.1, which makes use of the capacity effect of the human body to operate a thermionic valve relay, has numerous applications. As it can be adjusted to function when a person comes within any predetermined distance up to nine or ten feet, it is particularly suitable for controlling shop-window lighting. Not only does it provide a novel method of attracting attention, but it is a means of saving a considerable amount of electricity. What appear to be ordinary mirrors can be made to light up on approach and display some advertising sign.

The " Corpatact " relay

For use as a burglar alarm the apparatus can be made to actuate remote alarm bells or switch on the lights in the building. Doors may also be made to open and close on the approach of a person, while there are many other possibilities in connection with moving signs in cinemas, etc.



Unusual table standards now supplied by Aladdin Industries, Ltd.

A Lightweight Alkaline Cap Lamp

A new design of cap lamp has been produced by BATTERIES, LTD., Redditch. It is a lightweight alkaline type without separate battery or cell containers, anything in the nature of a liquid trap, with consequent danger of spillage, being avoided.

The "Nife" lightweight alkaline battery cap lamp, (top) the battery connections

The saving in weight has enabled several refinements to be incorporated, the total weight, it is claimed, being still below that of any other British-made alkaline cap lamp on the market. The battery is of the "Nife" alkaline type, and incorporates automatic electrolyte level indicators. During the process of charging the batteries are hung by their slotted terminals from the charging bars; in this manner wear and tear on the battery is avoided.

The head-piece is a strong bakelite moulding which houses a double filament bulb controlled by a switch on the side of the moulding. So that there is no possibility of the cable remaining "live" after an accident, a small cartridge type fuse is incorporated in the battery head. Complete, the lamp weighs only 5¼ lb., and is rated at 30 c.p., providing more illumination than is specified by the new Lighting Regulations.

A Safety Balancer

Extra long balanced travel, due to the use of a tapered drum, single cable and a new method of applying spring force, is claimed for the "Super Safety" counterpoise for portable electric tools of the CONSOLIDATED PNEUMATIC TOOL CO., LTD., 170, Piccadilly, London, W.1.

Clamp stops have been omitted, the stopping point being regulated by a mechanically operated Geneva gear. The single cable construction allows of inspection at any time and the removal of the cable without dissembling or altering the spring adjustment. For the handling of different loads it is possible for the tension of the springs to be altered by means of a hardened worm screw.

A Network Calculator

THE growing complexity of electrical networks has increased the difficulty of calculating the distribution of current and voltage under all operating conditions, and recourse has consequently to be had to test measurements on models representing the actual network on a smaller scale.

But simple d.c. calculating boards are limited in scope, while the a.c. equivalent has been regarded as too expensive and complicated for general use, and none has ever been utilised in this country. The employment of a novel principle, devised by Mr. C. L. Blackburn, has enabled a cheaper and more flexible form of construction to be adopted for the calculator which has been constructed for Messrs. Merz & McLellan by Electrical Calculators, Ltd.

This board, a portion of which was demonstrated at the Royal Society's conversazione last week, has forty-eight panels representing variable resistances and reactances. The panels can be so connected together by multiple flexible leads as to represent any desired network, the proper relations between the currents and voltages being obtained by interconnected transformers of variable ratio. A metering desk allows accurate measurement to be made of the magnitude and phase of the voltages and currents, and includes a cathode-ray tube to show the vector relations between these quantities.

The principles of vector multiplication involved may be extended to deal with three-dimensional vectors and, while potential transformers only are used in the present case, a completely analogous arrangement of current transformers may readily be made if desired.

The upper section (*a*) of the diagram (fig. 1) represents an elementary network of three resistances connected to a battery. The lower portion (*b*) shows the analogous scheme of connections used in the calculator, each resistance being represented by a two-winding transformer whose ratio represents the numerical value of the resistance. Two electrically separate circuits are always built up on the calculator; the first is formed by the voltage windings and is a direct representation of the original network, while the second is formed by the current windings and is a reciprocal representation of the original network.

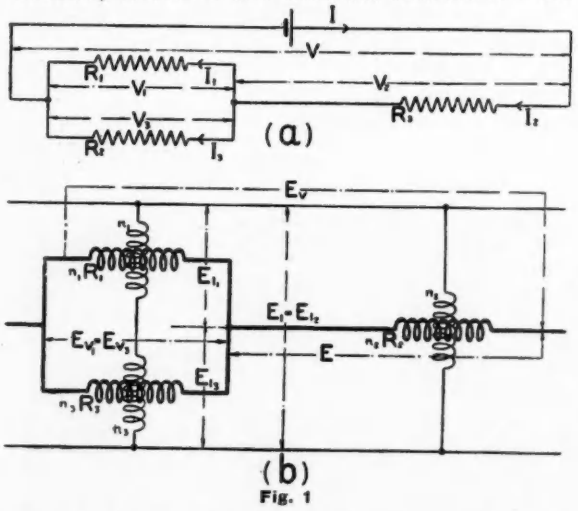


Fig. 1

Each unit panel contains a single transformer the ratio of which can be varied by tapping switches, or made negative or positive by a reversing switch, to represent different values of resistance. The panels are provided with two three-pin sockets at each terminal point so as to allow any number of panels to be connected together at a single point.

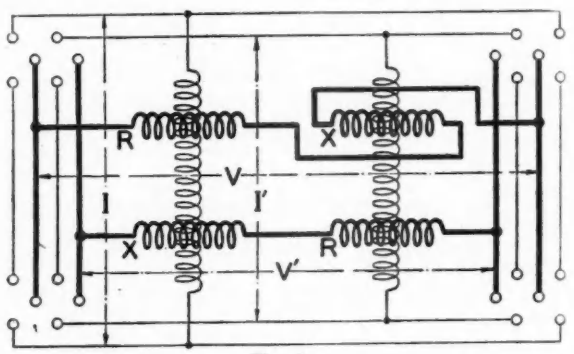


Fig. 2

The external connections are made with three-core connectors which follow directly the circuit of the original network, the direct connection of the voltage windings and the reciprocal connection of the current windings being brought about automatically by the arrangement of the sockets on each panel. The sockets not needed for connection are filled with short-circuiting plugs to complete the reciprocal circuits.

Although a two-circuit calculator suffices for certain kinds of investigation, a more complex arrangement is necessary when full account has to be taken of the phase relations and when the circuit units are impedances having both resistance and reactance.

For such conditions the calculator is arranged to deal separately (though simultaneously) with the resolved components of the currents and voltages, in phase or in quadrature with a given reference vector, and the four sets of voltages are confined to four electrically separate circuits (fig. 2). Each panel then has two transformers, each with one current and two variable voltage windings, with four six-contact terminal sockets and six-core flex connectors. Four separate circuits are then established, representing in-phase and quadrature and corresponding directly and reciprocally with the original network.

Each of the transformers is provided with a smaller compensating transformer which automatically provides the necessary exciting current by means of a thermionic valve. In this way possible errors due to voltage drop caused by exciting currents are greatly reduced. Provision is also made for periodical checking of all connections and the testing of the interconnecting cords.

Although the network calculator is an electrical instrument, it can also be used for calculating framework stresses and dealing with a variety of geometrical and physical problems.

Keeping a Progress Chart. By Cincinnatus

Application of the moving annual total principle to an undertaking's finances

THE annual accounts are a convenient form of representing, in a cross-section of time, the results of a certain activity, but this time period and its beginning and ending dates are arbitrary matters, and the choice of different ones will show different results. To obtain adequate perspective one can use the figures known as the moving average and the moving annual total. These concepts are valuable in the analysis and understanding of series of figures over long periods and during a year or other period.

An undertaking's activities are a dynamic series of operations needing an interpretation which uses the sense of trends. To compare the results of two companies having different financial years one needs to know the moving annual totals to the end of the same month. Such a moving annual total assists in developing a time sense. It is the twelve months' results at the end of each month, and provides continuity of figures, giving as a line plotted through time a valuable indication of the trend of a business, whether the figures used are sales of equipment to customers or of kWh to consumers, kWh generated or gross profits.

A distinct advantage of this figure is that it automatically eliminates seasonal variation. This is evident if one considers how the moving annual total is obtained. Taking sales as an illustration, those for the twelve months ended December 31st, 1935, represent one orthodox annual period. Add to them the sales for January, 1936, and subtract the sales for January, 1935, and there is available the twelve months' total from January 31st, 1935, to February 1st, 1936. Continue by adding the sales for February, 1936, and subtracting the sales for February, 1935; a new annual total from February 28th, 1935, to March 1st, 1936, is left, and the moving annual total proceeds on its journey through time. By adding a month, *i.e.*, February, and subtracting a February the effect of seasonal variation has been removed from the twelve months' total, and a useful trend line results. This gets over the difficulty of waiting twelve months before results are available on an arbitrary yearly basis, for there is always a year's results on hand.

One does not, of course, need to apply the moving annual total to all figures since the complexity of the work might become too unwieldy for the needs of an industrial undertaking in the hands of an enthusiast. For up-to-date organisations it is sufficient to produce monthly profit and loss accounts and balance sheets, and to apply moving annual totals to major figures such as sales, gross profits, net profits, output, &c., in order to discern clearly the trend of operations.

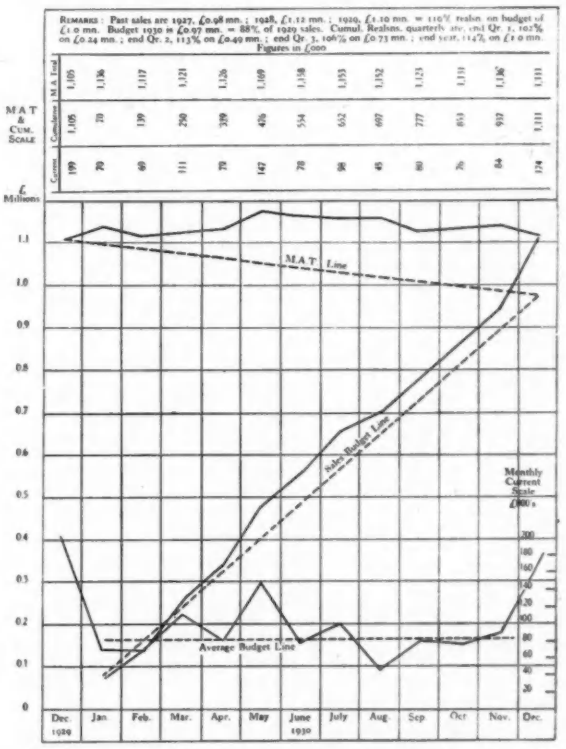
The Moving Average

One should refer here to the significance of the "moving average" figure. The word average is full of pitfalls and, whenever it is used, it is necessary to ask ourselves what average is really intended, the arithmetical average, the mid-point average (median), the typical or most commonly recurring figure (the mode) or some other figure to represent a central tendency in a series of figures. Among these is the moving average. It is very simple. For instance, the three months' moving average of sales for the first quarter of 1936 is the sum of the January, February and March sales, divided by three, and is located at the centre of the period, *i.e.*, February. The next three months' moving average is one-third of the total sales for February, March and April, and is located in March. In a similar way one can have a six months' or twelve months' moving average figure, and these averages are most useful when dealing with highly erratic figures in a time-series which one needs to study.

Obviously, it is possible to smooth a curve of erratic monthly data by using a suitable "moving average" and so discern the tendency of the monthly figures more clearly. The twelve months' moving average will naturally be one-twelfth of the moving annual total. This indicates a certain statistical limitation about the moving annual total, *i.e.*, that its trend, strictly speaking, reflects conditions before the end of the twelve-monthly period, but, in practice, the figure may be accepted as a useful guide.

Accountants are beginning to consider statistical methods of treating and presenting company data. The moving annual total figure has arisen from the application of the statistician's technique to figure data, and it has developed through the growth of the technique of budgeting. In this development a very useful chart has been contrived, using the moving annual total curve together with the normal budget curve, which represents an accumulative monthly total, compared with the estimated total corresponding to the budget itself. So useful is this chart (the Z chart) that it is worth while devoting attention to it here and illustrating this article with an example, as applied to a sales budget. In the accompanying specimen the sales budget is charted for the year 1930, and it has two scales, one covering sales, cumulative and moving annual total, the other covering individual monthly figures only. The "Z" formation of the three lines gives its name to the chart. Above are shown the totals of the three curves at the end of each month, and notes on previous budget figures are given in brief at the top of the chart. It is seen that the moving annual total of sales runs across the top of the chart from December 31st, 1929, to December 31st, 1930, its initial December figure being the sales total reached for the year 1929, and its final December figure the budget realisation for 1930.

The points are plotted in the middle of the spaces shown for each month, a method which is generally considered technically more correct than placing the points on the vertical lines marking the end of each month. The dotted lines of budgeted estimates show that a decrease in sales was expected during 1930, and it is apparent that a sort of direction-finder system results from having the two major lines, moving annual total of sales and cumulative monthly sales budget. These two lines must meet at December 31st, 1930, since each represents at that point in time a twelve months' total ending December 31st, 1930.



An average dotted line is shown for the monthly sales, this being simply one-twelfth of the budget for the year. The actual monthly sales oscillate around this line and, with a reasonably consistent seasonal variation, a more exact curve of monthly sales could be substituted for the straight line. This would be a refinement—or complexity—only justified when analysis of sales over a period of years had shown definite seasonal variation.

In the illustration, the hypothetical results prove more satisfactory than the sales manager anticipated, for at the end of the first quarter of 1930 the curve of actual sales had crossed over the curve of estimated sales, and continued to keep on the positive side throughout the year.

Forecasting Annual Sales

The keeping of a series of "Z" charts of this type from year to year, using the same scales and chart field, provides a useful analysis of progress, and makes it possible to see what has taken place much better than with columns of figures. Further, as the particular yearly period of the budget nears its close the direction of the moving annual total curve and of the cumulative sales curve indicate the probable final sales result with increasing closeness. Conclusions from these

converging lines would naturally be modified by a knowledge of the general characteristics of the last months during past years, and by any features of the current year which were unusual. When one is considering such a factor as sales, which may be the name given to billed sales resulting from a certain volume of orders, then the plotting of the curves of orders will provide a further guide to probable budget realisation.

In the case of a manufacturing company the primary curves to watch will naturally be orders received, sales and orders on hand, whereas with a supply undertaking conditions are less complicated and sales in money and in units sold and/or output generated are the important data. The analysis of sales will probably be by main categories, the supply undertaking separating out the growth of domestic, power, lighting and traction consumption for analysis.

This method of treating figures in budgeting and in analysing results is a practical one; an examination of the trend idea inherent in this method will show its soundness. As a rule, too much time and energy is concentrated in many organisations upon reaching a certain position at December 31st of the year irrespective of what happens afterwards. The exciting activities towards the end of the year in some concerns are based upon the idea of making a good exhibition. Notwithstanding this bustle, the operations and the results of a producing organism cannot be shown by a cross-section in time, but by progressive figures.

Accountancy and its "wangling coefficients" are stretched to the elastic limits of their techniques; accrued billings and merchandise shipped but not billed join the ranks of sales, and orders on hand include the doubtful weight of certain items that may be in the January list of "cancellations." In this connection it is unfortunate that the publication of quarterly balance sheets and profit and loss accounts by industrial undertakings is not required by law. Much inefficiency and delusion in annual window-dressing competitions among industrial concerns and banks, and in accounting manipulations, might be avoided if the trend sense were more highly developed among people in industry generally. The use of trend figures and their visual interpretation on the "Z" chart should be more widely extended, and it leads to further considerations of a similar kind regarding the study of the way in which seasonal variations and business cycles affect an undertaking's results, and the effect of these forces upon policy as well as results.

Trend need not be a straight line movement in business figures; it may be a parabola or even a logistic curve. It is necessary to analyse data thoroughly before coming to conclusions, and the moving annual total is a simple way of getting at trend, which avoids the more lengthy statistical analysis involved in fitting a line or curve to a long period series of data. By "long period" I imply from seven to ten years or more, covering one business cycle in all its phases. Such long period analyses belong to economic research rather than to immediate annual results, and few have the patience or the inclination to study the growth of their particular enterprise in detail. While it may not seem worth while to the executive engaged in negotiating new business, it may seem worth while to the administrator who has to evolve major policy and who knows that a time sense is a valuable asset; that a business grows in characteristic phases; and that its early development is often very significant to its present policy. There is much to reflect on in the Eastern paradox which runs: "The future does not come from before to meet us; it comes streaming up from behind over our heads."

Parliamentary News (BY OUR SPECIAL REPORTER)

WHEN the Select Committee of the House of Commons resumed its consideration on May 26th of the Gas Light and Coke Co.'s Bill, Mr. Craig Henderson, K.C., addressed the Committee on behalf of the West Ham Corporation in opposition to the Bill. He said that there was no public case for the Bill, though an attempt had been made to put forward such a case by suggesting that the aim was freedom of choice for the tenant. It was true that in the past some local authorities had imposed agreements on tenants binding them not to use gas, but West Ham had not offended in that way, and such agreements were prohibited by the Act of 1934.

Now the gas company sought a statutory right to enter the houses of local authorities owning electricity undertakings and put in gas pipes. There was already freedom of choice in West Ham. If a tenant said he wanted gas, the gas company could, and did, put in gas pipes. It was suggested that the gas company would save money by putting in pipes when the house was being built. That was not a sufficient reason for this Bill. There was no justification for a gas company entering a house unless the tenant in it wanted a supply of gas.

On May 27th Mr. J. W. J. Townley, borough electrical engineer of West Ham, giving evidence in opposition to the Bill, said that between 1928-9 and 1933-4 the number of electricity consumers in the London and Home Counties area rose from 763,000 to 1,498,327, an increase of 96 per cent. Most of that increase was accounted for by domestic consumers, and among people of the poorer classes. Not only was there now an overwhelming preference for electric lighting, but an increasing demand for electric cookers.

Dealing with the position in West Ham, Mr. Townley said that when the gas company began to canvass electricity consumers in council houses, he retorted by canvassing gas consumers. The gas company got some of his people, and he got a larger number of theirs. The net result was twenty gains for gas and thirty-three for electricity.

Mr. J. H. Thorpe, K.C., who appeared for twenty-seven local authorities in the company's area of supply, said that if the gas company had the right to "carcase" houses the same right should be given to electricity companies, and then no doubt the Coal Owners' Association would wake up and insist on the right to put in fireplaces. It might not stop there, because already in Warsaw and San Francisco people were generating heat and distributing it to houses. That system might be adopted in this country, and those people would claim the right to put in hot-water pipes. The whole thing was illogical. The tenants' freedom was not the real concern of the gas company. It was thinking of its own interests.

On May 28th, at the close of counsel's final speech for the promoters, Mr. Ben Smith, a member of the Committee, asked whether the gas company would cease what had been called "pestering canvassing" if it got the right to canvass houses.

Mr. Tyldesley Jones, K.C., said he did not accept the phrase, and he was certainly not prepared to say that the gas company was not entitled to put before tenants the merits of gas when its competitors had an advertising medium in the Housing Department.

In announcing the decision of the Committee, the chairman (Sir John Ganzoni) said that they had found the matter somewhat difficult to decide, but on balance they were unanimous in thinking that, in the interests of tenants, the Bill should be allowed to proceed. They were, however, not at all satisfied about the intensive canvassing which seemed to have been conducted on both sides, and they thought the parties should put their heads together and try to abate it. The matter would be dealt with in the Committee's report to the House.

Cornwall Electric Power Bill

This Bill was considered on May 28th by the House of Commons Committee on Unopposed Bills. Capt. R. C. Bourne presided. Mr. Sidgwick, for the promoters, explained that although they were authorised to supply electricity for lighting—they were the first company so authorised—they had, in fact, operated as a power and bulk supply company. The supply for domestic and general purposes in the county of Cornwall was given by a number of distributing companies controlled, with two exceptions, by Edmundson's Electricity Corporation. With the approval of the Electricity Commissioners, it was proposed that the undertakings controlled by Edmundson's should be transferred to the promoters.

It was also proposed to increase the share capital to £1,500,000, with borrowing powers up to half that amount. It was anticipated that the capital powers would be fully exercised in four years. Then, under the powers of this Bill, the company could either ask the Electricity Commissioners to sanction further loan capital up to £750,000, or apply for a Special Order authorising the raising of new share capital.

The Committee found the preamble proved, and ordered the Bill to be reported for third reading.

Trolley Vehicle Extensions

Four Bills confirming Provisional Orders made by the Ministry of Transport for the extension of trolley vehicles in provincial towns were submitted on May 28th to the House of Commons Committee on Unopposed Bills. In Reading, where power to convert the tramways to trolley vehicles was obtained last year, there are to be ten miles of new routes; and in Derby, Doncaster, and Darlington there are to be short extensions of existing routes. All the Bills were approved, and were ordered to be reported for third reading.

Reduced Radio-telephone Rates

On May 26th Mr. Viant asked the Postmaster-General if he could state the result of the reductions in overseas radio-telephone rates which were made last year; and whether any further reductions in these rates were contemplated.

Major Tryon said that the reductions in the radio-telephone rates to Australia, South Africa, and India which were made last June had resulted in a satisfactory increase in traffic. The reduced night rates which were introduced in the services to Canada and the United States in June last had also proved popular; and arrangements had now been made with the telephone authorities in those countries for a further reduction of rates from July 1st next. The rate between London and New York or Montreal would be reduced from 40s. to 28s. a minute during the day, and from 28s. a minute to 20s. a minute at night, the cheapest telephone rate that had ever

been available across the Atlantic. The night rate would also be available throughout Sundays.

Supply to Suffolk Villages

Mr. Granville asked the Minister of Transport on May 27th whether he was aware that the East Anglian Electric Supply Co., Ltd., was unwilling to supply the smaller villages in Suffolk with electricity for economic reasons; and whether he would, in the public interest, make representations to the company with a view to its supplying these villages and, in particular, Kelsale.

Mr. Hore-Belisha said that the Electricity Commissioners had recently discussed with the company the carrying out of further developments in villages in East Suffolk (including Kelsale), and at present awaited formal proposals from the company.

Bills Advanced

Royal Assent was given to the following measures on Friday last week:—The Electricity Supply (Meters) Bill, the North Wales Electric Power Bill, and the Swansea and District Transport Bill.

In the House of Lords on May 28th the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Bill was read a second time.

Swiss Electrical Exports and Imports

SWITZERLAND'S electrical export trade declined as a whole last year, as compared with 1934. Although there was an increase of about 10 per cent. in shipments of dynamo-electric machinery (with Italy and India good customers) and a fair rise in those of some of the lighter descriptions of unspecified apparatus, these advances were largely offset by a fall in foreign sales of meters and measuring instruments. But in 1935 Switzerland's exports of dynamo-electric machinery were four times the value of her imports of these goods, which fell by 20 per cent. as compared with 1934.

Electrical imports into Switzerland showed a fairly heavy decline last year, the only noteworthy exception being telegraph and telephone apparatus (other than wireless material). The following table shows the values of imports and exports in the chief groups, with notes of increases or decreases compared with 1934. In has been extracted from the recently issued official foreign trade returns. The rate for the Swiss franc is about 25 to the £ at par and 15 to the £ current.

EXPORTS	1935. Swiss frs. (000).	Inc. or dec. on 1934. Swiss frs. (000).
Accumulators—		
Total	597	− 83
To France	391	− 79
„ Australia	15	+ 15
„ Italy	49	− 11
„ Germany	25	+ 1
Insulators—		
Total	56	+ 16
To Spain	9	+ 9
„ India	8	+ 8
Meters and measuring instruments—		
Total	11,050	− 955
To France	2,713	− 197
„ Belgium	1,068	− 463
„ Holland	1,125	+ 207
„ United Kingdom	1,057	+ 254
„ Spain	742	+ 88
„ Italy	661	+ 15
Telephone and telegraph apparatus—		
Total	368	− 80
To Italy	79	+ 20
„ Belgium	52	—
„ Great Britain	64	+ 44
Radio apparatus—		
Total	300	− 353
To Holland	107	− 141
„ Germany	82	− 14
Glass rectifiers, with or without mercury—		
Total	79	+ 37
Unspecified electrical apparatus, over 500 kg.—		
Total	977	− 12
Ditto, 50 kg. to 500 kg.—		
Total	1,581	− 171
To France	300	− 188
„ Spain	131	+ 17
„ India	147	+ 124
„ Italy	79	− 5
Ditto, 3 kg. to 50 kg.—		
Total	2,558	+ 570
To France	470	+ 38
„ Italy	496	+ 232
„ Holland	122	+ 15
„ Spain	149	+ 33
Ditto, under 3 kg.—		
Total	901	− 102
Dynamo-electric machines—		
Total	8,716	+ 756
To France	1,413	− 491
„ Italy	1,267	+ 877
„ Spain	813	− 50
„ India	470	+ 275
„ Canada	343	+ 220
„ Argentina	317	− 147
„ Brazil	242	+ 186
„ China	276	− 77
„ Germany	603	+ 197
Electric locomotives—		
Total	154	+ 16
Insulated wire and unarmoured cable—		
Total	271	− 142
To Italy	80	+ 13
Cable, not lead covered—		
Total	101	+ 31
Electric incandescent lamps—		
Total	744	+ 75
To Germany	672	+ 134

IMPORTS	1935. Swiss frs. (000).	Inc. or dec. on 1934. Swiss frs. (000).
Accumulators—		
Total	348	− 58
From Germany	113	− 45
„ France	109	+ 24
Insulators—		
Total	157	− 225
From Germany	89	− 208
„ Denmark	58	− 19
Meters and measuring instruments—		
Total	1,006	+ 15
From Holland	39	− 16
„ Great Britain	56	+ 5
„ United States	94	+ 36
„ Germany	561	− 28
Telephone and telegraph apparatus—		
Total	1,626	+ 396
From Germany	766	+ 94
„ Belgium	788	+ 305
Radio apparatus—		
Total	6,647	− 570
From Germany	1,420	− 403
„ Holland	3,263	− 103
„ United States	709	− 36
Glass rectifiers ("glow-cathode") with or without mercury—		
Total	65	− 10
From Belgium	23	+ 21
„ Holland	16	− 14
Unspecified electrical apparatus, over 500 kg.—		
Total	43	− 155
From Germany	32	+ 17
Ditto, 50 kg. to 500 kg.—		
Total	164	+ 57
From Germany	86	+ 23
„ France	28	+ 12
Ditto, 3 kg. to 50 kg.—		
Total	435	− 45
From Germany	260	− 106
„ France	52	+ 3
„ United States	47	+ 27
Ditto, under 3 kg.—		
Total	852	− 181
From Germany	723	− 249
„ France	37	—
Dynamo-electric machines—		
Total	2,081	− 502
From Germany	711	− 224
„ France	408	− 14
„ Italy	196	+ 117
„ Holland	206	− 94
Electric locomotives—		
Total	—	—
Insulated wire and unarmoured cable—		
Total	137	− 74
From Germany	59	+ 9
„ France	24	− 54
„ Holland	42	+ 6
Cable, not lead-covered—		
Total	278	+ 8
From Germany	193	+ 21
Cable, lead-covered—		
Total	170	− 6
From Germany	121	− 25
„ Italy	21	+ 7
Electric incandescent lamps—		
Total	2,024	− 447
From Germany	624	− 218
„ Holland	965	− 26
„ Austria	239	− 97

Economic Conditions in the Netherlands East Indies

IN his report to the Department of Overseas Trade on the economic conditions in the Netherlands East Indies (Stationery Office, 2s. net) Mr. L. B. S. Larkins, Commercial Agent, Batavia, states that the years 1933 and 1934, following a time of acute depression, may be said to have represented a period of economic consolidation and reallocation which showed some welcome first-fruits in 1935, but now permanent the present improvement is likely to be depends entirely on world conditions. Dealing with exports, he states that the group "rubber and gutta percha" increased in volume from 357,600 tons in 1933 to 470,000 tons in 1934, and in value from fl. 37.8 million to fl. 88.7 million. During the first half of 1935 exports of rubber declined by 29,700 tons, but this decrease was mostly due to the fact that 58,800 tons less rubber could be exported during the first half of the year under the restriction measures. Exports of tin continued to increase in value.

With regard to imports, the Netherlands Philips group enjoys a virtual monopoly in the supply of electric lamps. Holland and Germany were the most important suppliers of steam boilers, turbines and parts, internal combustion engines, pumps, machinery and industrial tools, electrical machinery and apparatus, with the United Kingdom and the United States competing for the third place. As the official amount of the United Kingdom's share of this import trade is small, it seems probable that some of the imports from Holland may have comprised goods of United Kingdom origin. The fact that of the 282 internal combustion and electric motors (mostly small units) installed during the first half of 1935 at least 110 were of United Kingdom origin appears to justify such a conclusion. A German group is in a favourable position to further sales of electrical machinery and apparatus, and United Kingdom manufacturers would be well advised to take steps to meet this competition.

With the exception of Bandoeng, where rates are more competitive, the charges for electricity, in spite of certain reductions, are still too high for electric stoves to compete effectively with gas or oil burners. As ice is cheaper than electricity, many people prefer to use ice chests for domestic cold storage rather than electric refrigerators. The virtual monopoly enjoyed by Netherlands manufacturers through the patents registered in the Netherlands East Indies has so far excluded any opportunities for competition; but, as it is understood that the majority of these patents expire this year, there is a possibility that the market may become a little more open to United Kingdom and other manufacturers. Japan headed the list of countries supplying electric lamp batteries in 1934, with strong competition from the United States and Hongkong, but the production (55/60,000 batteries per diem) of the new works established in Java by the National Carbon Co., Inc., is already reducing the importation of these goods. Japan secured the market for single cell and ordinary batteries, the only notable competition coming from the United States. The introduction of restrictions on imports of flashlight batteries may be expected.

Certain communications formerly maintained by submarine cables have been replaced by wireless connections, and in several places land lines, which were costly to maintain, have been replaced by radio. Only one or two local cables now remain, and it is anticipated that these will soon be abandoned. In March, 1935, there were 17,000 wireless receiving sets in use.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The Bath & West Show

One of the stands which attracted most attention at last week's Bath and West and Southern Counties Show held at Neath was that arranged by the British Electrical Development Association in conjunction with the Electricity Departments, of Bedwellty, Cardiff, Gelligaer, Neath, Newport, Pontardawe and Swansea, the South Wales Power Co., and the Swansea Branch of the Electrical Contractors' Association. Electrically heated incubators and brooders, egg-testing lamps, sterilising chests, separators, clippers and shearers were features of the poultry and dairy farm exhibits, and visitors were shown how useful a small portable motor can be on the farm. The method of utilising soil-heating cables was demonstrated, together with a thermostatically controlled tubular heater for greenhouses. Pumps of various types occupied another section of the stand, while other interesting exhibits were an electric lawn mower, a grinding mill and a root pulper and cleaner. Domestic electrical equipment was well represented, and demonstrations were given of cookers, water-heaters, washing machines, refrigerators, and other modern labour-saving devices. How six 2-lb. loaves could be baked for one kWh of electricity was shown in the industrial bakery section, where the equipment displayed included cake mixers, a prover and a water-heater. Full particulars relating to the exhibits, as well as details of electricity charges in the various districts, were obtainable from an information bureau. The following manufacturers co-operated in producing the display:

Abell & Smith's Electrical Co., Ltd.; Aidas Electric, Ltd.; James Beresford & Son, Ltd.; British National Electrics, Ltd.; Burnley Components, Ltd.; English Electric Co., Ltd.; Falk, Stadelmann & Co., Ltd.; Ferranti, Ltd.; Frigidaire, Ltd.; Fram Construction Co., Ltd.; General Electric Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Jackson Electric Stove Co., Ltd.; Johnson & Phillips, Ltd.; R. A. Lister & Co., Ltd.; Revo Electric Co., Ltd.; Santon, Ltd.; Simplex Electric Co., Ltd.; and Spratt's Patent, Ltd.

On a separate stand Messrs. Petters, Ltd., had a selection of their latest oil engines and combination sets specially adapted to the needs of farmers.

Cable Works Extension

The extension to the premises of the Mersey Cable Works, Ltd., Linacre Lane, Bootle, announced some months ago, has now been completed, and it has become necessary to further increase the capacity of the factory. Another new building is in course of construction which will enable the company to undertake a class of work for which it has not formerly been equipped.

Stainless Steels for Electrical Uses

Messrs. Samuel Osborn & Co., Ltd., Clyde Steel Works, Sheffield, have drawn our attention to their "Evershyne" and "Weldshyne" stainless steels, which they say can be used for a variety of purposes in the electrical industry, particularly as they are non-magnetic. Typical uses are sheets and castings in electric furnace construction, binding strips, panelling and instruction plates on generating plant; reflectors, spring clips for bar elements and decorative parts in electric fires; and floodlight projectors.

New Showroom at Wetherby

The new showroom of the Electrical Distribution of Yorkshire, Ltd., in the Market Place, Wetherby, was formally opened on May 21st by Major Dawson, chairman of the Wetherby Rural District Council. Mr. R. W. Wickham, chairman of the company, said that it had extended its supply to twenty-three villages in the Wetherby district and was now supplying more than half the premises at an average price of less than 2¼d. per kWh. The remarkable growth of the use of electricity for domestic purposes had necessitated the opening of a new showroom in the centre of the town, where the residents could see and buy all the electrical apparatus they wanted. Major Dawson, in declaring the showroom open, said that the population of the rural district had increased in the last ten years from 14,624 to 16,449 and was still growing rapidly. In the new showroom, apart from the display of all types of domestic apparatus, there is an electric kitchen in which regular demonstrations will be given weekly.

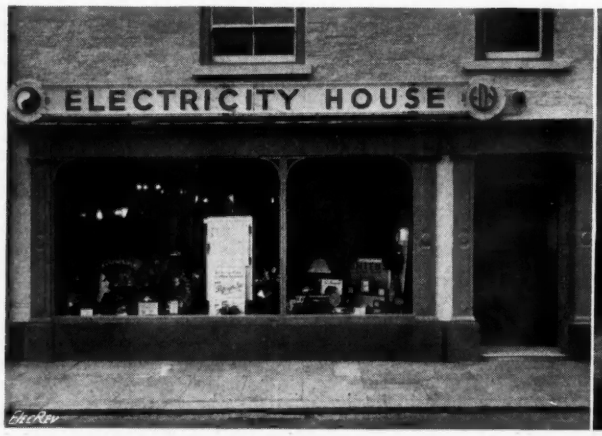
A Works Lighting Installation

The accompanying illustration shows a large installation of Simplex reflectors, using 400-W electric-discharge lamps, which has recently been completed at the works of Messrs. Wadkin & Co., machine tool manufacturers, Leicester. The new lighting equipment has been found to be very successful and obviates the need of all forms of local lighting. It is interesting to note that the wiring arrangement has been devised so that the adjacent rows are on different phases, with a view to minimising any possible stroboscopic effect. The Simplex fitting No. L1401 used for this installation incorporates a focusing adjustment which enables any size of mercury-vapour electric-discharge lamp from 150-400 W to be utilised and, at the same time, the light distribution can be adjusted to suit the particular height and spacing used. The reflectors are mounted at a height of 31 ft. 6 in. and they are 31 ft. 6 in. apart.

An installation of Simplex reflectors with 400-W electric-discharge lamps at Messrs. Wadkin & Co.'s Leicester works

A Cannock Installation Contract

The question of whether it is fair and honest dealing for a local authority to invite tenders for contract work and finally to select one of its own department's tenders, although not the lowest, was debated at a special meeting of the Cannock Urban District Council last week. The meeting had been called for the acceptance of tenders for special work in connection with thirty-two houses which the Council is erecting by direct labour on a site at Longford Road. For the electrical installations at the houses seven tenders had been received, and the Housing Committee recommended that that of the



The new showroom of the Electrical Distribution of Yorkshire, Ltd., at Wetherby

Council's own Electricity Department at £197 should be accepted. Of the registered firms tendering the lowest price was £185 and the highest £200. Councillor T. Whitehouse moved as an amendment that the tender of Messrs. Barber & Wilkes at £185 should be accepted. He said he agreed with the principle of direct labour, and believed they should support it so long as it came within the bounds of straightforward and honest dealing, but to give it preferential treatment over other tenders was wrong. The tender of the firm he suggested should be accepted was a lower one, and, in addition, the firm were local ratepayers and properly qualified and registered tradesmen. He did not think it fair trading to ask private people to give time and trouble to the preparation of tenders unless such tenders had a fair chance of being accepted. When a vote was taken the amendment to give the work to Messrs. Barber & Wilkes was carried by six votes to five.

British Oxygen Company's New Offices

On the occasion of the opening of its new head office at Thames House, Millbank, and to celebrate the fiftieth anniversary of the company's foundation, the British Oxygen Co., Ltd., gave a luncheon, which was attended by about five hundred members of the staff and guests, at Grosvenor House, Park Lane, on Thursday last week. Responding to the toast of "The Visitors" proposed by Mr. P. B. Liversidge (joint managing director), Lord Melchett declared that the company had made immense strides in the past few years, and was one of the most advanced scientific concerns in the world. The chairman, Mr. J. D. Pollock, stated that all the steel using companies were dependent on the gases produced by the company, whose products would find more and more applications. Preceding the luncheon an opportunity was given to inspect the new offices, which occupy the whole 37,000 sq. ft. of the first floor of the southern section of Thames House. In addition to the general offices, there are some fifty private rooms for the directors and managerial staff. We were told that the company is doing an increasing amount of work in its electric welding department.

A portion of the general offices at British Oxygen Co.'s new headquarters at Thames House

Irish Free State Electrical Imports

April last proved an active month as regards the imports of electrical machinery and allied material into the Irish Free State, a total of £86,627 having been attained as compared with £63,759 in the corresponding month of 1935. The aggregate imports during the four months ending with April last amounted to £306,606, as against £287,247 in the corresponding period a year ago. The details of the imports are appended :—

	Jan.—April. 1935. £	1936. £
Electric motors	17,890	19,530
Other electrical machinery	71,455	67,629
Dry batteries and parts	6,688	5,170
Electric lamp bulbs	19,360	19,634
Elec. lighting accessories, fittings and parts	24,290	30,159
Elec. wires and cables, insulated	29,863	29,025
Teleg. and teleph. apparatus	1,633	3,549
Radio receivers, complete	20,234	17,340
Radio-gramophones	1,386	465
Other radio apparatus, fully or partly assembled	1,949	2,050
Radio parts and accessories	21,717	21,660
Other electrical goods and apparatus	70,782	90,395
Totals	£287,247	£306,606

As will be seen, the imports of "other electrical machinery" and five of the other items, shows a slight falling off, the remaining six advancing.

Moulded Casing for Electric Tools

An intricate moulded casing is being made by Birkbys, Ltd., for the electrically operated tools of the Westminster Tool & Electric Co., Ltd. It is manufactured from a special shock-resisting grade of "Elo" moulding and, it is claimed, has a high mechanical strength; is unaffected by moisture or oils; and does not warp. It has a mahogany colour.

A section of the "Elo" moulded electric tool casing

Orders Recently Booked

Among the orders received by the Lancashire Dynamo & Crypto, Ltd., in the home market during May were the electrical equipment for two Sulzer high-pressure steam generating plants, including three drip-proof, slip-ring motors for the high-pressure feed pumps. Each motor is 1,000 b.h.p. at 1,480 r.p.m. The total h.p. aggregates over 4,200 and includes induced draught fan motors, forced draught fan motors, powdered fuel mill motors, etc. Export orders include two complete electrical equipments for dredges for the Malayan Tin Dredging Co., each equipment aggregating 1,600 h.p. An order covering twelve motors has also been received in connection with a further extension to the Southern power station of the Calcutta Electric Supply Corporation, Ltd. A 400-h.p. synchronous motor is being supplied to the Cawnpore Cotton Mills, Ltd.

Flame-proof Apparatus

In order to meet the growing need for certificates of flame-proof enclosure to cover inflammable gases and vapours met with in certain industries, the Mines Department has issued two new circulars numbered 85 and 86. The first deals with the conditions under which the Department is prepared to report (but without certification at present) on electrical apparatus intended to be flameproof with respect to town's gas and coke-oven gas; in testing the gas mixture regarded as representative will contain 60 per cent. of hydrogen and 40 per cent. of methane. The second circular states the conditions under which apparatus will be certified for (1) methane, (2) petroleum and acetone vapours, and under which it can be marked as tested (but not certified) for coal gas and coke-oven gas. The marking prescribed must be applied to all apparatus of types certified by existing certificates and manufactured after May 20th. A note is included regarding the registration of non-manufacturing firms supplying such apparatus under their own names.

Works Fire

Messrs. Laurence, Scott & Electromotors, Ltd., ask us to state that exaggerated reports have appeared concerning a fire which occurred at their Manchester works last week. The fire was confined to a section of the offices, and the factory was unaffected. The works are in full production and the staff of the offices affected have been accommodated in other parts of the building.

The B.E.A. Handbook

The British Engineers' Association has now published the 1936 edition of its "Classified Handbook of Members and their Manufactures." This directory is in similar form to previous editions, and in addition to an alphabetical list of members there is a useful guide to engineering products in this country. It is being circulated to selected buyers of engineering equipment in the home and overseas markets, and copies will be posted free of charge to those interested in the purchase of British engineering plant, machinery and accessories, on application to the secretary of the Association, 32, Victoria Street, S.W.1.

Developing the Water-heating Load

The value of the water-heating load is stressed in a new report (E.D.A. 1338) just issued by the British Electrical Development Association Domestic Water-Heating Committee to all members of the Association. Reviewing the past five years' progress, it is stated that statistics show that the annual growth in the number of water heaters connected by supply authorities is in the neighbourhood of 50 per cent., and that this tends to increase each year as more experience is obtained of the advantages of electric water heating, both by the public and the supply authorities. The question of special tariffs has diminished in importance as the general cost of electricity for domestic purposes has fallen, and the cost of electricity now being generally favourable, the chief requirements for further development of electric water heating are concerned with facilities for the purchase and installation of appliances and the correct selection and application of the most suitable apparatus. Maintenance costs are stated to be lower than for any other kind of domestic appliance. After analysing the requirements of the market, the report goes on to describe, with photographs and diagrams, the various types of installations, indicating the most suitable for each class of house. Hints on installation work, including conversion systems, follow, together

with an outline of sales policy and publicity methods. Characteristics and costs of alternative methods and other useful data are given in appendices, and the report concludes with a summary of the Committee's recommendations. A pocket is provided in the cover for holding other E.D.A. water-heating publications.

Salt-mine Illumination

Messrs. Norrington & Landon, Ltd., tell us that the projectors used to floodlight the salt face in the mines visited by the Transmission Section of the I.E.E. (ELECTRICAL REVIEW, May 22nd) are " Blaizolite " projectors.

The Westinghouse Chippenham Works

The accompanying picture is an aerial view of the Chippenham works of the Westinghouse Brake & Signal Co., Ltd. This factory stands on thirteen acres of land close to Chippenham Station on the Great Western Railway, to which it has siding accommodation. The original shops were built by Evans O'Donnell and Co., railway signal engineers, in 1895. In 1903 Messrs. Saxby & Farmer moved their works from Kilburn, London. When this firm amalgamated with the Westinghouse Brake & Saxby Signal Co., Ltd., in 1920, the works of McKenzie & Holland, Ltd., were moved from Worcester to Chippenham. In 1933 the London works of the Westinghouse Brake Co. were also moved to Chippenham. Advantage was taken of these amalgamations and transfers to build, extend and re-equip the factory, keeping it up to date in plant, equipment and organisation, and enabling the manufacture of the many products to be carried out with the maximum efficiency.

An aerial view of the Westinghouse works at Chippenham

In this factory are now produced power and mechanical signalling plant, compressed air, electro-pneumatic and vacuum brakes for railways, air compressors, steam heating, air and vacuum brakes for road vehicles, power decking and air lock control plant for collieries, and metal rectifiers of all sizes from radio types to big industrial installations for electro-plating, &c. In February, 1935, the name of the company was changed to its present title, the Westinghouse Brake & Signal Co., Ltd. Machinery in the various departments is motor driven, electricity being obtained from the national grid and transformed from 11,000 V, 50 cycles, 3-phase to 400 V, 50 cycles, 3-phase, in the factory sub-station. The total number of employés now engaged in this factory is approximately 2,150.

Change of Address

The Glasgow branch of Messrs. W. T. Glover & Co., Ltd., has been transferred to more commodious premises at 215, West Campbell Street, Glasgow, C.2; telephone, Douglas 3856.

Scottish Electrical Contractors

The annual general meeting and week-end Conference of members of the Electrical Contractors' Association of Scotland was held at Taymouth Castle, Perthshire, from May 22nd to 25th. The annual general meeting was held on the Friday afternoon. The financial statement submitted showed the Association to be in a flourishing condition, and reports were submitted on the commercial agreements arranged by the Association and on the Fair Trading Policy recently issued, which policy received the cordial approval of the members of the Association. The Policy was discussed in some detail and the hope was expressed that the other bodies which had co-operated in its preparation would immediately take steps to put it in force throughout the industry. On the Saturday forenoon the usual golf match, East *v.* West, for the Pratt Trophy, was held, the West being victorious by 9 matches to 5, with several matches halved. On the Saturday afternoon the second session was held. Mr. Deans, the new President, read a paper on the dangers of direct labour, particularly by municipalities, pointing out that in several cases it had been ascertained that this method of carrying out installation work was a snare and a delusion so far as economy was concerned, when compared with competitive contracting. A discussion followed. The second session of the conference was opened by Mr. Alexander Pratt, Leith, who read a paper on technical education, explaining in detail the methods of working in connection with the classes for apprentices held at the Bellevue School, Edinburgh. Mr. Pratt is convener of the Contractors' Committee which supervises and advises as to these classes. He explained that one of the main objects of the teachers was to make the course of instruction as practical as possible and to keep the subjects on which instruction was being given well within the educational attainments of the apprentices so far as mathematical knowledge was concerned. He was convinced that these classes were steadily improving the standard of work of those who ultimately became young journeymen, and that this was bound to have a good influence throughout the trade. On Friday evening, after dinner, a dance was held in the Banner Hall of the Castle, and on Saturday evening there was a whist drive.

Polish Electrical Exhibition

It is announced that a metallurgical and electrical exhibition will be held in Warsaw between August 23rd and October 11th. The organisers of the show are the Polish Associations of Mechanical Engineers, Metallurgists, and Electrical Works, together with the Warsaw Chamber of Commerce and Industry.

For Sale

Brighton Corporation has for disposal four sets of three single-phase frame reactors.

Messrs. Lucas & Pyke invite offers for the purchase of an oil engine, dynamos and battery.

Mr. V. G. P. Brough, of Messrs. Knox Burbridge & Co., invites offers for the purchase of a wet-ground mica manufacturing business.

(See our classified advertisements.)

The Fittings at Leeds Town Hall

From our description of the lighting installation at Leeds Town Hall (ELEC. REV., May 29th, page 792) readers might gain the impression that the Sun Electrical Co., Ltd., had carried out the installation work. We wish to correct the statement which might be so construed, as the Sun Company only supplied the material; it does not in any circumstances engage in electrical contracting work.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price. June 3rd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£183	£5 dec.
Grade II... ... ... ,,	£127	£3 dec.
Grade III ... ... ,,	£68	£1 dec.
c Brass (rolled metal 2" to 12" basis) ... per lb.	7½d.	—
c ,, Tubes (solid drawn) ... ... ,,	9½d. to 10d.	—
c ,, Wire, basis ... ... ,,	7¾d.	½d. dec.
c Copper Tubes (solid-drawn) ... ,,	10½d.	—
g ,, Bars (best selected) ... per ton	£68	£2 dec.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£41 15s.	—
d ,, Wire Rods ... ... ,,	£47 15s.	—
d ,, ,, H.C. Wire ... per lb	7½d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/– plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	9d.	—
i Iron, Pig (Cleveland No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£17 10s.	—
g Mercury ... ... per bot.	£11/17/6 to £12/7/6	—
e Mica (in original cases) small ... per lb.	9d. to 1/6	—
e ,, ,, ,, medium ... ,,	5/– to 10/–	—
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¾d.	—
p ,, ,, rolled strip & sheet ,,	11¾d.	—
p ,, ,, wire ... ... ,,	1/0½	½d. dec
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	—
g Spelter ... ... per ton	£14 3s. 9d.	6/3 dec.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£202	£2 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our " Business Notes " under the same heading.

German Cable Exports

Since the large falling off in the exports of German cables and covered wires in 1933 and 1934, a considerable improvement has ensued. Exports of cables increased from 18,406 metric tons in 1934 to 25,437 tons in 1935, and for the first quarter in 1936 the quantity was 6,295 tons. In the case of covered conductors, the exports rose from 10,104 tons in 1934 to 14,168 tons in 1935, and were 4,021 tons in the first three months of the current year. The principal customers for cables in Europe are Holland, Sweden and Norway, while in overseas countries the largest buyers are Argentina, British India and China. The total value of the exports of cables and insulated conductors in the first quarter is returned at about 6,000,0000 Rm.

New Electricity Showrooms

The new showroom and inquiry bureau of the Plymouth Corporation Electricity Department at 83, Old Town Street, Plymouth, is being opened to-day (Friday).

The Electricity Supply Rifle League

As a result of the May matches the leaders in the various divisions of the Electricity Supply Rifle League were as follows:—First division, "City "A"; second division, City "C"; third division, "Clesco"; fourth division, Barking "B."

An Office and Works Lighting Conference

A conference on electric lighting in works and offices was held on May 19th and 20th at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C. The conference was opened by Sir John Brooke, who said that nearly 700 factories were actually started in the London area from 1932 to 1934 and employment was given to 50,000 additional persons. These factories were, in the main, well equipped electrically. Mr. W. J. Jones gave a lecture on "The Science of Seeing," and a discussion followed. Mr. H. Lingard dealt with lighting units and fundamentals, and Mr. A. D. S. Atkinson spoke on the production of colour by absorption filters. The economics of industrial lighting were covered by Mr. J. W. Howell, following which Mr. D. R. Wilson, Chief Inspector of Factories, opened a discussion. Other subjects dealt with were electric lamp characteristics, by Dr. A. B. Whitworth; a factory lighting installation, by Mr. M. W. Hime; the lighting of commercial buildings, by Mr. E. B. Sawyer; and the treatment of special lighting problems, by Mr. R. O. Ackerley.

Cooking Demonstrations at Southend

A series of demonstrations of electric cooking and other electrical domestic appliances was held recently at the Pier Pavilion, Southend-on-Sea, under the auspices of the Corporation Electricity Department (borough electrical engineer, Mr. A. C. Johnson). The proceedings commenced with an entertainment by well-known artistes, and this was followed by cooking demonstrations by Miss A. Powell, B.H.Sc. Around the walls of the Pavilion were arranged various types of electric cookers and other apparatus.

Conditions in the Engineering Industry

The annual conference of the National Committee of the Amalgamated Engineering Union opened at Morecambe on June 1st. Mr. J. C. Little, in his presidential address, said that during the past year there had been a steady improvement in every branch of the industry, and even the export sections, although they were still adversely affected, showed considerable advance. Having regard to the disturbed conditions in Europe that was not surprising. There did not appear to be much opportunity for further improvement in the near future, but there was no need to be pessimistic; the problem would right itself in due course. He referred to the "parrot cry" of a shortage of skilled labour and pointed out that the Ministry of Labour returns showed that there were nearly 100,000 unemployed engineering workers, and there were still thousands of their own members who could find no work, although they were skilled men. The membership of the union now stood at 241,322, an increase of 28,496 in the past twelve months.

New Catalogues and Lists

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, London, W.C.2.—A folder giving the latest prices of electric lamps.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—An illustrated description of the Callender cables installed in the *Queen Mary*.

T. M. C.-Harwell (Sales), Ltd., 233, Shaftesbury Avenue, London, W.C.2.—Leaflets dealing with switches and switch-plugs.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—Catalogues of electric fans of the domestic and exhaust type.

L. G. Hawkins & Co., Ltd., 30, Drury Lane, Kingsway, London, W.C.2.—A leaflet describing the "Tecal" tea-making equipment.

Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, 6.—A complete catalogue of electrical supplies.

Elexcel, Ltd., Victor Works, Broad Green, Liverpool, 14.—A complete illustrated catalogue of "Xcel" heavy duty cooking equipment.

International Combustion, Ltd., Aldwych House, Aldwych, London, W.C.2.—An illustrated art booklet entitled "A Survey of Boiler Plants." It contains clear cross-section diagrams and actual erection photographs, together with a concise description.

Seal Electric, Ltd., 7, Edward Street, Westminster, London, S.W.1.—A catalogue of conduit fittings which the company manufactures.

Bankruptcy Proceedings

C. W. Coombes, "Verdley," Portsmouth Road, Milford, Surrey, electrical engineer.—The first meeting of creditors herein was held on May 22nd at 29, Russell Square, London, W.C.1. According to the statement of affairs there were gross liabilities of £350, of which £262 was expected to rank for dividend and there were net assets of £100, leaving a deficiency of £163. Debtor stated that from January, 1919, till December, 1931, he traded in partnership with another as electrical engineers at Hindhead. Debtor then commenced on his own account at Milford, Surrey, but was unsuccessful. About two years ago he assigned his interest in the amount then owing by his partner to a trade creditor, to whom he owed £200. He attributed his failure to loss on contracts through underestimating. The case being a summary one was left in the hands of the Official Receiver.

P. K. Eichenberger, 30, Market Place, Boston, wireless dealer.—The first meeting of creditors was held recently at 4 and 6, West Street, Boston, when the statement of affairs showed gross liabilities of £279, of which £228 was expected to rank for dividend. The assets were estimated to realise £132, but they were subject to preferential claims of £28, so that there was a deficiency of £124. In October, 1929, the debtor commenced trading as a wireless dealer at the above address. At that time he had a capital of £5, and obtained wireless sets and components from wholesalers on sale or return. The business was not a success and in July, 1932, he executed a deed of assignment on behalf of his creditors, and a dividend of 4s. in the £ was paid on claims of £409. The debtor attributed his failure to insufficient trade. The case being a summary one was left in the hands of the Official Receiver as trustee.

A. G. Applegate, radio dealer, 47, Trinity Street, Frome.—Receiving order made May 12th on debtor's own petition. Public examination July 14th at the County Court Offices, Frome. The first meeting of creditors was held on May 26th at the Official Receiver's Office, 26, Baldwin Street, Bristol. The statement of affairs disclosed gross liabilities of £444, of which £442 was expected to rank for dividend, with net assets of £132 and a deficiency of £310. The debtor attributed his failure to ill-health, competition, lack of capital, losses on hire-purchase agreements and bad trading position. The case, being a summary one, was left in the hands of the Official Receiver as trustee.

A. P. Steer, 73a, Fore Street, Bovey Tracey, Devonshire, formerly Station Road, Bovey Tracey, wireless dealer.—The receiving order herein was made on the debtor's own petition, and he has returned a statement of affairs showing gross liabilities of £638, of which £528 is expected to rank for dividend, with net assets of £115, and a deficiency of £413. The debtor attributes his failure to liability to his late partner, lack of free capital, competition, bad debts and losses due to customers defaulting under hire-purchase agreements, ill-health of wife and expenses attendant thereon, and costs of suing creditors. Public examination will be held on June 11th at the County Court Offices, Torquay.

V. J. Donnison, trading under the name or style of the Electrical Service & Repair Co., 56, King Street, South Shields, lately carrying on business at Jesmond, Newcastle-upon-Tyne, electrical dealer.—The public examination was concluded at the County Court, Sunderland, recently. At the previous hearing it was stated that there was a deficiency of £1,007. Debtor attributed his failure to losses on contracts and on his shop at Jesmond.

A. W. Cowgill, 26, Water Street and 49B, Vale Road, both Rhyl, radio and electrical engineer.—This debtor attended at the Court House, Bangor, recently, for his public examination. The gross liabilities were £1,868, and there was a deficiency of £1,364. Debtor attributed his failure to depreciation of stock, bad debts, excessive advertising, and losses on returned wireless sets. The examination was closed.

H. L. Rowlands, electrician, Chalcot Crescent, Regent's Park, N.W.—The public examination of this debtor was held at the London Bankruptcy Court on May 26th, the accounts showing one liability of £1,775 arising out of a motor cycle accident, and assets of £5. The examination was concluded.

R. A. Robinson (Highbury Engineering Works), radio and electrical engineer, 287, Upper Street, Islington, N.—Application for discharge to be heard June 16th at Bankruptcy Buildings, Carey Street, W.C.

R. Mason, radio and electrical engineer, Crown Square, Kirbymoorside.—Last day for receiving proofs for dividend, June 6th. Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, Official Receiver.

E. W. Hills, radio dealer, 20, Havelock Road, Hastings.—Last day for receiving proofs for dividend June 10th. Trustee, Mr. L. C. Clark, 24, Ship Street, Brighton.

J. C. Parnell (Ventnor Wireless Co.), wireless dealer, 82, Langdale Road, Hove.—Receiving order made May 27th on a creditor's petition.

T. Otaki (Lloyd Electric Lamp Co.), 8, Rangoon Street, E.C.3 (separate application).—Discharge suspended for six months until November 1st, 1936.

H. Yeo, radio engineer, Market Place, Stratton, Cornwall.—Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver, released May 11th.

B. Sheechman (Pentonville Radio), 269, Pentonville Road, N.—First and final dividend of 3½d. in the £, payable at Bankruptcy Buildings, Carey Street, W.C.

H. Carnell, radio engineer, 94, East Hill, St. Austell, Cornwall.—Receiving order made May 27th on a creditor's petition.

L. G. Bailey, radio dealer, 1, Port Soderick Street, Salford.—Receiving order made May 18th on debtor's own petition.

J. Robertson, electrical engineer, 68, Arran Road, Catford, S.E.—Last day for receiving proofs for dividend June 16th. Trustee, Mr. C. R. Waterer, 29, Russell Square, W.C.

Company Liquidation

Leeds Radio Services, Ltd.—Meeting July 6th at the Hotel Metropole, Leeds, to receive an account of the winding-up by the liquidator, Mr. J. Beardsworth.

Electricity Supply

Lighting, Domestic, Power

Addington (Surrey).—EXTENSIONS.—The County of London Electric Supply Co. is to extend its mains in the vicinity at a cost of £2,615 in connection with housing developments.

Annfield Plain.—STREET LIGHTING.—The Urban District Council has agreed to supply electricity for street lighting in Morrison Road for the Stanley Urban District Council, provided there is a minimum annual consumption of 8,000 kWh.

LOAN.—Application is to be made to the Electricity Commissioners by the Urban District Council for permission to borrow £500 for electricity services.

Aylesbury.—MAINS AND SERVICES.—The Town Council has received sanction to a loan of £15,000 for mains and services.

Austria.—100,000-V TRANSMISSION LINE.—In a recent issue of *E.u.M.*, Herr Hans Krautt gives particulars of the 100,000-V transmission line which has been erected between Wegscheid and Timelkam, a distance of about 40 miles, by the Austrian Power Co. The purpose of the new line is to connect, for peak supply purposes, the lignite-burning steam-operated power station at Timelkam with the company's distribution system. The line, which is supported on "Porr"-type cement masts, spaced at distances of about 250 yd., consists of six hard copper conductors each with a sectional area of 120 sq. mm.

Birkenhead.—MAINS AND EQUIPMENT.—The Electricity Committee has obtained sanction to borrow £18,360 for mains and sub-station equipment.

Bradford.—SAFEGUARDING THE SUPPLY.—Following the serious supply failure in February, consideration has been given to the question of securing greater safeguards of continuity of supply, and at the same time of providing for an increased output from the Valley Road power station. At a special meeting of a sub-committee last week schemes estimated to cost £342,244 were recommended. It is proposed to erect three switch-houses, which, with equipment, will cost about £270,900. In certain cases, existing 6.6-kV, 0.05 sq. in. cables are to be replaced by others of 0.25 sq. in., while medium voltage and traction cables in the Manchester Road district are to be extended and an additional 6.6-kV, 0.25 sq. in. cable laid in connection with the Manningham high-voltage feeders. Further, 33-kV cables are to be laid between the Valley Road power station and Dudley Hill transforming station, and between the power station and Four Lane Ends sub-station.

Brighton.—NEW CABLES.—A cable is to be laid for the Electricity Department between the Droveway and Preston Park sub-stations at a cost of £4,479, and also one across the canal at Southwick, at a cost of £5,000.

A change-over scheme for the Seven Dials area costing £41,274 has been approved.

Bulgaria.—ELECTRICITY IN SOFIA.—According to the report of the Compagnie d'Electricité de Sofia et de Bulgarie for the last financial year, the sales of power during the twelve months amounted to 35,211,910 kWh, as compared with 34,467,028 kWh in 1934. The number of consumers increased from 56,471 to 59,363, and the load on the power station from 25,500 to 27,350 kW. The company now has 15½ miles of 35-kV transmission line, 20½ miles of 6- to 7-kV lines, 64½ miles of 7-kV underground mains and 297 miles of low voltage mains, the latter being an increase during last year of 12¾ miles.

Cardiff.—LOWER TARIFF.—The Electricity Department has reduced its tariff for off-peak supplies for charging electric vehicles and for bakers' ovens.

Carlisle.—NEW MAINS.—The City Council is to extend its mains to Castletown and Cumwhitton at a cost of £1,414.

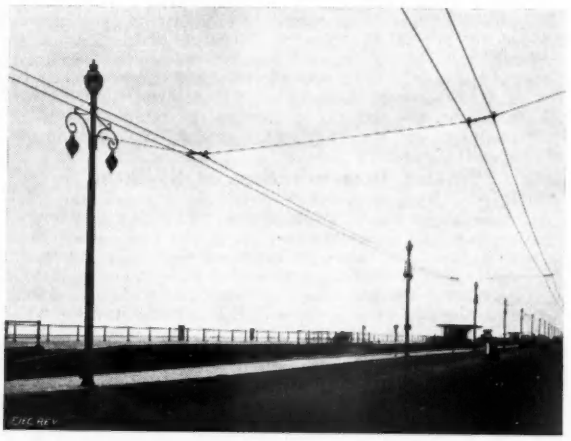
Chelmsford.—DISTRIBUTION LINES.—The County of London Electric Supply Co., Ltd., has acceded to the request of the Rural District Council that the proposed distribution line on Galleywood Common should be placed underground. Overhead lines are to be erected with the Council's consent at Great Baddow, Broomfield, Danbury, South Hanningfield, Great Leighs, Little Leighs and Great Waltham.

Cheltenham.—EXTENSIONS.—Overhead lines are to be extended to Salterly at a cost of £2,256 to complete the ring.

Chester.—NEW EQUIPMENT.—Mr. S. E. Britton, the city electrical engineer, reports that owing to the growth of building operations and the demand for electricity in the Hoole district, it is necessary to modify and increase the switchgear at the Hoole sub-station, provide an additional sub-station and erect a high-voltage feeder between Hoole and Mickle Trafford. Tenders are to be invited for the buildings and the supply and installation of the necessary switchgear and transformer. The estimated cost of the work is £6,200.

Chesterfield.—A YEAR OF PROGRESS.—Information regarding the working of the Chesterfield electricity undertaking provided by Mr. D. H. Davies, the borough electrical engineer, in his report for the year ending March 31st last, shows that the amount of electricity sold was again a record at 18,406,477 kWh. The two largest increases were in the quantities sold for heating and cooking and on the domestic combined rate, which together increased by 28 per cent., and the next largest improvement was for private lighting (10.9 per cent.). An additional 806 consumers were connected, and the number using electricity for domestic purposes in addition to lighting was 3,869. Altogether, there are now 15,935 consumers connected to the system or 94 per cent. of the whole of the premises in the borough. A further 473 kW was connected for lighting purposes, 2,328 kW for domestic purposes and 520 kW for power purposes, making a total increase in connections of 3,321 kW. The total load now connected to the system amounts to 39,213 kW, and the number of houses connected under the hired wiring scheme is 8,415. There are 14,523 domestic appliances on circuit, including 1,072 cookers, 3,670 fires, and 280 wash-boilers and water-heaters. An additional 11½ miles of mains were laid, bringing the aggregate up to 301½ miles, and there are now thirty-four public and fifteen private sub-stations connected to the system. The working costs increased slightly from 0.72d. to 0.74d. per kWh sold, due to the higher proportion of energy purchased in bulk as an experiment. The net profit for the year amounted to £3,030, this being £1,436 lower than in the previous year, due to special expenditure out of revenue and alterations in the tariffs for hired wiring and prepayment meter rents. The average price received for the whole of the supply was 1.19d., which was practically the same as in the previous year.

Cleethorpes.—SALES UP 41 PER CENT.—Owing to the new method of meter reading which came into operation last year, Mr. B. S. Lord, the electrical engineer and manager, can only estimate the sales of electricity during the year ended March 31st last in his report for that period. However, the amount given (3,134,518 kWh) is stated to be approximately correct, and as last year's sales were 2,224,423 kWh, a 41 per cent. increase is revealed. This excellent result is partly due to the fact that a large amusement park was connected for the first time, taking 140,550 kWh during the season, while development in the domestic field was encouraged by the Council's decision to extend its hire and hire-purchase arrangements to apparatus apart from cookers. Other commendable features of the year's working are that the complete system functioned without interruptions of any kind, while the load factor improved from 23.88 to 25.2 per cent. The average price per kWh was 2.109d., a reduction of 0.531d. on the previous year, and further modifications of charges are in prospect. The number of consumers at the end of March was 5,470; of the 656 who were added during the year, 207 took advantage of the Department's assisted wiring scheme.



Ornamental street lighting units (G.E.C.) along Hastings promenade

Clitheroe.—SUPPLY TO NEWTON.—A supply of electricity to Newton and district, provided by the Corporation, has been inaugurated.

Dartford.—A loan of £2,339 for street lighting improvements in the town has been sanctioned.

Earby.—LOWER CHARGES.—Reductions in charges for electricity supplied for general lighting, street lighting and local cinemas have been approved by the Council.

Eccles.—LOAN.—The Electricity Committee is seeking sanction to borrow £8,000 for consumers' services.

Folkestone.—PURCHASE OF UNDERTAKING.—The Town Council has reappointed a sub-committee to consider charges for electricity and the Corporation's right to purchase the Folkestone and Elham electricity undertakings.

France.—200-kV UNDERGROUND CABLE.—A new 200-kV underground cable has recently been completed between the power station at St. Denis, Paris, and the sub-station at Clichy-sous-Bois, where it connects with a line at the same voltage from the Creney sub-station. It is claimed to be the first in the world operating at so high a voltage to be laid underground.

Guisborough.—LOWER CHARGES.—The Urban District Council has altered the tariff for domestic power from 1½d. per kWh to 1¼d. for the first 50 kWh, and 1d. per kWh beyond, less ten per cent.; the discount for residential lighting is increased from 10 per cent. to 16⅔ per cent., and the discount on ordinary lighting from 16⅔ per cent. to 25 per cent.

Holland.—IMPORTED ELECTRICITY.—As the Dutch Government considers it inadvisable to permit the supply of electri-

city from other countries, such as is now taking place in the frontier provinces, a Bill has been prepared to prohibit the acceptance of foreign supplies without the permission of the Ministry of Public Works. In the case of existing arrangements, application for permission to continue them must be made within six months from when the new law comes into force.

Lancaster.—ELECTRICITY FOR COUNCIL HOUSES.—As a result of interviews with the Ministry of Health, the Corporation has approved the principle of installing electricity in all houses on the Corporation estates not already wired, with no increase of rent.

SPECIAL ORDER.—A Special Order has been granted to the Corporation extending its area of supply so as to include a portion of the rural district of Garstang at present included in the area of supply of the Preston Corporation.

Leicester.—STREET LIGHTING EXTENSIONS.—The Corporation has obtained sanction to borrow £10,000 for street lighting extensions.

Llanfairfechan.—LOWER CHARGES.—The charge for electricity consumed for ordinary domestic lighting purposes is to be reduced from 8d. to 7d. per kWh, the concession to date from April 1st last.

London.—ELECTRICITY SUPPLY REGULATIONS.—Under the former Board of Trade regulations the sanction of the London County Council was required to any change in the system of supply by undertakings in the metropolis. In issuing their revised and consolidated code of regulations, however, the Electricity Commissioners assumed sole sanctioning authority in respect of such alterations from January 1st, 1935. As it appeared that the conditions afforded consumers less protection than those of the Council, the Commissioners were asked to include the following requirements: In any cases in which the system of supply is to be changed, the undertaking shall serve on the affected consumers a copy of the conditions imposed on them by the Commissioners, and that the conditions shall safeguard the consumers in respect of the installation as well as of the apparatus. Furthermore, that differences arising between undertakings and consumers shall be referred to an electrical inspector appointed by the Council. The Commissioners agreed to give effect to the first suggestion, but as regards the second they required that any dispute should be referred to an arbitrator appointed by the Minister of Transport. However, before advising the Minister on any application for the appointment of an arbitrator in London, they agreed to consult with the County Council. At its last meeting the Public Control Committee decided that, the Council's points having thus been substantially met, it would take no further action.

VOLTAGE TESTS.—It is reported that two additional stations for testing the voltage of electricity supplies were established in London during 1935, making the total number 163. In all, 725 records were taken during the year, each extending over a period of a week.

ST. PANCRAS.—The Electricity Committee is to borrow £26,376 for mains in connection with the change-over, and is seeking sanction to proceed with the work, which the electrical engineer estimates will eventually cost £127,771.

STOKE NEWINGTON.—The Electricity Committee recommends that where an original consumer makes a request to purchase an assisted wiring installation and the additional revenue from the consumption of electricity is not sufficient to cover the initial cost of the installation, this shall be transferred to the consumer upon payment of the difference between the additional revenue from the consumption of electricity and the total amount represented by the initial cost, the establishment charges (calculated at 20 per cent.) and a nominal sum of five shillings, upon the signing of an agreement indemnifying the Council against any further liability for maintenance.

The Electricity Committee is to install rising mains at blocks of flats at a cost of £2,204.

Malvern.—CHANGE OF SUPPLY VOLTAGE.—The Urban District Council has received sanction to the alteration of the supply voltage from 100 to 230.

Maulden (Beds.).—STREET LIGHTING.—A system of electric street lighting is proposed. An estimate of the cost has been provided by the Bedford Electricity Department.

Plymouth.—METERS.—Sanction to borrow £16,000 for meters has been obtained by the Electricity Committee.

Russia.—INCREASING USE OF PEAT AS POWER STATION FUEL.—Peat has assumed considerable importance in Soviet Russia in recent years. It is now used as the main fuel in fourteen of the largest regional electric power stations. Last year more than 25 per cent. of all the power supplied by the generating stations under the Central Power Administration was obtained from peat and, in addition, it almost exclusively supplies power for the largest industrial districts in the Moscow, Leningrad, Gorky and Ivanovo provinces. The total output of peat during the present year has, reports the *Monthly Review* of the U.S.S.R. Trade Delegation in Great Britain, been fixed at 20 million tons, or twelve times the quantity produced in 1913.

St. Neots.—REVISED TARIFFS.—Following protests against the revised tariffs of the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co., St. Neots Chamber of Commerce has written to the company setting out its grievances. For business premises the charges were formerly based on the total installation, but in future they are to be assessed on the maximum demand. For domestic use, charges will be based on the amount of floor space of the dwelling.

Scarborough.—OFFER TO PURCHASE UNDERTAKING.—Last week the Council in committee considered an offer made by a company to purchase the electricity undertaking. It was decided that members and officials of the Council should meet representatives of the company and submit a report.

South Shields.—MODERNISING THE ELECTRICITY UNDERTAKING.—On the recommendation of Mr. N. T. Smith, the newly appointed electrical engineer, the Electricity Committee has approved a £250,000 scheme for modernising the electricity undertaking, and the matter is being submitted for the confirmation of the full Council. It is proposed to change the main source of supply from 2,000 V to 11,000 V and to introduce a uniform voltage. It is intended to carry out the work within a period of seven to ten years. For the first year's instalment, it is suggested, a new and more powerful supply should be provided for the King Street and Fowler Street areas. This section would cost £30,000. A small part of the town is at present supplied at 110 V, but it is proposed to raise this to 220 V to bring it into line with the rest of he district.

Stirling.—ELECTRIC TIMEKEEPING.—The Town Council has decided that four of the public clocks in the burgh shall be converted from mechanical to electrical operation. Three of them will strike electrically.

Stoke-on-Trent.—RURAL SUPPLIES.—Steps are being taken by the City Council to give a supply of electricity to the villages of Longbridge Hayes, Brindley Ford, and Packmoor. Canvassing is proceeding.

Sutton Coldfield. — CHANGE-OVER. — Revised change-over schemes for the Doe Bank and Four Oaks areas, estimated to cost £5,898, have been approved by the Electricity Committee.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £489 to supply fifty-six houses to be erected in Grange Road, Four Oaks.

STREET LIGHTING.—At a cost of £820 the Lighting Committee is to provide street lighting in Eachelhurst Road.

Sweden.—NEW ELECTRIC POWER STATION.—The Crown Prince has just inaugurated the new Malfors hydro-electric power station on the Motala river, states *Reuter's Trade Service* from Stockholm. This big power station, which is Government-owned, and, like other stations of the kind, will be placed under the administration of the Government Department Vattenfallsstyrelsen (Waterfall Board), is at present constructed for only 20,000 kW, being of the same size as the Vargön power station which was completed not many years ago. The Malfors power station cost Kr.8,800,000 to build, or a million less than the estimated amount. The difference in the water levels for this power station is 28 metres. The total potential output of the waterfalls and rapids of the river is 330,000,000 kWh, and on the stretch between lakes Vättern and Roxen the water power, which is there estimated at 150,000,000 kWh, is now nearly all exploited. Another big power station, built at the Krängede rapids on the Indalsälven river, will shortly begin to deliver power to Stockholm and some of the big North Swedish industries. This station,

A New Tasmanian Power Scheme

SINCE the present demand and commitments are more than sufficient to load fully the Waddamana and Shannon hydro-electric plants, the Hydro-Electric Commission has taken further steps to develop the island's water power by establishing a new power station at Tarraleah, deriving its power from the Upper Derwent River. Details of this scheme are given in the *Australian Electrical Engineer and Merchandiser*.

The level of the water at Lake St. Clair, from which the river is fed, will be reduced by 10 ft., and a weir 25 ft. high will be constructed at Butler's Gorge. Later, a dam, 120 ft., will probably be constructed at this site. From here the water will be carried by canal, reinforced concrete flume, and steel pipes to the power station on the west bank of the Nive, a tributary of the Derwent. The ultimate continuous capacity of the development is 88,000 h.p., and it is proposed to install five 22,000 h.p. generating units.

Initially, however, only three 22,000 h.p. units will be provided. The units will consist of Pelton wheel turbines supplied by Boving & Co. (London), and direct coupled to Brown-Boveri alternators; operation will be with water of a static head of 990 ft. at a speed of 428 r.p.m. Each will have two bucket wheels, both supplied with water from two jets. The normal output of the generators will be 18,750 kVA at 11,000 V, 50 cycles. An outdoor sub-station is being designed to step up the voltage to 88,000 V for transmission to Hobart, and, by means of the transmission line which is now supplying power from Waddamana for construction purposes, the station will be tied in with the Waddamana and Shannon stations. All parts of the lines which are in a mountainous district will be "snowproofed" by having three phases arranged in a horizontal plane, an arrangement which has proved successful on the Waddamana-Tarraleah line.

which initially will have a capacity of 60,000 kW, is not Government-owned.

Transcaucasia.—NEW HYDRO-ELECTRIC STATION.—The construction of a hydro-electric station at a height of 2,300 metres above sea level, on the slopes of the Alages Mountains, is to begin next month. It will be the highest power station in Transcaucasia, and will supply the Talin district, including ten collective farms. The turbines for the new station are to be produced by the Lepse Plant, in Erivan. It is hoped that the station, which will cost nearly half a million roubles, will be put into operation by the end of 1937.

Tredegar.—DEPARTMENTS SEPARATED.—At last week's meeting of the Urban District Council it was decided that the Gas, Water and Electricity Department should be divided into (a) a Gas and Water Department, and (b) an Electricity Department. Mr. J. Stockton said that this would "give the freedom necessary to their infant child, electricity, and prevent it becoming a rate-aided industry in the near future." Mention was made of the early commencement of the second portion of the electricity scheme at a cost of £17,000.

Traction

Darlington.—TROLLEY-BUSES.—Tenders are to be obtained by the Corporation for eight double-deck trolley-buses.

Italy.—ROLLING STOCK.—For the operation of the 3,000-V d.c. lines from Florence to Rome and Naples, Rome to Avezzano, and Tarvisio to Trieste, all of which have been opened to electric traction since October last, the Italian State Railways ordered 213 electric locomotives, twenty-four motor coaches, and several streamlined trains at a total cost of 250 million lira. Practically all these units have been delivered within a period of eighteen months from the placing of the orders. A further twenty-five light motor coaches are now being built at a cost of 8 million lire.

Liverpool.—TRAMWAYS INQUIRY.—A scheme is being put forward by the Transport Department to relieve the traffic at points in the centre of the city by making greater use of Victoria Street as a tram route and having a double track in North John Street. The matter was the subject of a Ministry of Transport inquiry last week, local traders and commercial associations opposing the scheme. For the Department it was stated that in Lord Street at the peak periods 377 cars an hour passed, while in Dale Street there were 316 cars and at the Town Hall 441 cars. Victoria Street and North John Street would be used during the peak periods as a return route.

Newcastle-on-Tyne. — TROLLEY-VEHICLES.—Consideration has been given by the Transport Committee to the extension of the trolley-bus system which was introduced on the Newcastle-Wallsend route nearly a year ago. No details are yet known as to the routes over which it is proposed to operate the vehicles.

Norway.—ELECTRIC RAILWAYS.—The Norwegian Parliament has approved the Government scheme for the electrification of the railway between Oslo and Kornsjö, which is to be completed in 1939. Connection with Swedish lines for which concessions are being sought will enable the Norwegian line to be linked with the lines to Göteborg and further southwards.

South Africa.—DURBAN MARSHALLING YARD.—The Congella marshalling yard and sorting sidings to the south of Durban have been electrified by the South African Railways as part of the scheme for the electrification of the main line from Cato Ridge to the coast. The yard has over 20 miles of sidings, and double-bogie locomotives built by the railway's own workshops are being used for shunting.

Sweden.—TESTING ELECTRIC TRAINS.—A report in *The Times* states that an electric train of the Swedish State Railways weighing 560 tons has run from Malmö to Ange from 6 a.m. to 10 p.m. without the locomotive being changed. This represents a distance of 626 miles and constitutes a world record, the previous record of 441 miles having been held by the United States.

Switzerland.—FAST ELECTRIC TRAINS.—It is reported in *Swiss Industry and Trade* that a number of new light electric trains are to be put into service shortly between Geneva, Lausanne, Berne and Zurich. The average speed will be 85 km. (52¾ miles) per hour.

MORE ELECTRIFICATION.—The budget of the Swiss Federal Railways for 1936 contained provision for the electrification of only the Gossau-Sulgen and Locarno-Giubiasco lines, but supplementary estimates have now been added for the conversion to the standard 15-kV system of the Sonceboz-Munster route, an important connecting line 20 miles long in the west of Switzerland.

Communications

Canada.—CONTROL OF BROADCASTING.—A message from *The Times* Ottawa correspondent states that the report of the Parliamentary Committee appointed to investigate the operations of the Canadian Radio Commission, which has just been published, reaches the same conclusion at its predecessor of 1934, namely, that the establishment of national broadcasting in Canada presents many difficulties the solution of which will require time, experience and a large expenditure of public money. It recommends that the Canadian Radio Broadcasting Act of 1932 shall be repealed and a new Act substituted which will place the direction of broadcasting in the hands of a Corporation, with an honorary board of nine governors chosen to represent all parts of Canada, and operating through a general manager and an assistant general manager responsible to the board for the conduct of all the business of the Corporation. The report reaffirms the principle of complete nationalisation of broadcasting in Canada and, pending its accomplishment, the maintenance of the fullest co-operation between the Corporation and private broadcasting stations. It recommends that the Corporation shall be endowed with substantially the same powers as the B.B.C., and that in addition it shall have exclusive control over the character of all programmes, broadcasts by private stations and over all wire line networks used for rediffusing broadcasts.

France.—U.S.A. RADIO-TELEPHONE LINK.—The American Ambassador, Mr. Jesse Straus, and the French Minister for Posts and Telegraphs, M. Mandel, last week inspected the work on the radio station which is being erected for direct radio-telephonic communication between France and the United States Transmission trials will begin in a month's time, and the work will be completed by July.—*Reuter.*

Northern Ireland.—NEW B.B.C. STUDIOS.—The British Broadcasting Corporation has purchased a site at Belfast for new studios for the Northern Ireland Regional station.

Sweden.—TELEPHONE EXPANSION.—It is reported in *The Times* that during the first four months of 1936 13,600 new telephone subscribers were registered in Sweden, compared with 26,600 for the whole of 1935. Sweden now has 641,700 telephone subscribers.

Paris "Metro" Progress

INTERESTING details of the work of the electrical department of the Compagnie du Chemin de Fer Metropolitain de Paris, which operates the "Metro" underground electric railways in the French capital, are given in the recently-issued annual report for 1935. Altogether, there are now twenty-five sub-stations supplying power to the system, of which 66.5 per cent. are equipped with rotary convertors and 33.5 per cent. with mercury rectifiers.

The report further states that escalators are gradually being installed to replace lifts, there being now sixty in operation. The latest escalators do not require an attendant, an emergency stopping device, which can be operated by the passengers being provided. A photo-electric system which automatically brings the escalators to a stop when there are no passengers, and restarts them when any person or persons pass the infra-red rays, is provided at certain stations, and it is stated that the new equipment is effecting an economy of 40 per cent. in power consumption.

Increasing attention is also being paid to the provision of lighter and more powerful rolling stock with the object of improving acceleration by dividing the power over a greater number of axles.

Work has recently been commenced on the provision of an improved lighting system at the stations. The first to be completed are the two stations known as Richelieu-Drouot Nos. 8 and 9. With the object of securing illumination approaching that of daylight a combination of different tubes has been adopted at the No. 9 station, the lamps consisting of two light sources placed end-to-end in the same horizontal plane. In each there are two tubes, one a red neon and the other a tube containing uranium salts with a mixture of argon-mercury (green), the whole being enclosed in a opaline glass diffusing casing; the resulting light has a pale pink tint. On each of the 246-ft. platforms at the station there are eleven of these lighting units, equally spaced at a height of about 11 ft. above the ground, the total loading being 4,870 W. A different system of lighting has been adopted at the No. 9 station, where incandescent lamps are used. Each of the two 262-ft. platforms is provided with eighteen lights consisting of 150-W lamps set in opaline-glass diffusing globes, the installation totalling 5,400 W. The lamps are fixed at equal distances of about 14 ft. 6 in., and at a height of 10 ft. above the ground. Ten open diffusing globes with 100 W lamps are also provided. As compared with the replaced system totalling 2,400 W, seven times better lighting is now obtained, it is stated.

According to M. A. Vallat, of the Société pour le Perfectionnement de l'Eclairage, lighting by incandescent lamps on the lines of that now in operation at the No. 9 station is to be adopted at the majority of the Metro stations, with, however, different shapes of globes in order to avoid any impression of a monotonous uniformity, before the opening of the International Exhibition in Paris next year.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—June 23rd. U.D.C. Electricity Department. E.h.v. cable and switchgear. (See this issue.)

Aberdeen.—June 15th. Town Council. One 15,000-kW turbo-alternator with condenser and auxiliary plant. (May 22nd.)

Alcester.—June 22nd. R.D.C. Installation of a vertical spindle sludge pump and a sludge elevator with electric motors, pipes, fittings, &c., at the Studley sewage disposal works. Engineer and surveyor, Bleachfield Street (deposit £2 2s.).

Ashford (KENT).—U.D.C. Electricity Department. Underground cables for one year. (See this issue.)

Basford (NOTTINGHAM).—June 8th. R.D.C. Dismantling existing steam plant and installing electrical laundry plant at the Hucknall Road Sanatorium, Nottingham. J. J. Ellis, engineer and surveyor, Rock House, Stockhill Lane (deposit £2 2s.).

Birmingham.—June 12th. Electric Supply Committee. E.h.v. and l.v. cables at Hams Hall power station. (May 22nd.)

Blackpool.—June 16th. Borough Council. 6,600-V 3-phase compound filled metal-clad draw-out switchgear for twelve months. (May 29th.)

Bridport.—June 27th. Electricity Department. Two 1,000-kVA and three 50-kVA transformers and 6,600-V switchgear and metering equipment. (See this issue.)

Brighton.—June 11th. Corporation. Electrical work in seventy-four houses in Piltdown Road, Nuthurst Road and Wiston Road. W. N. C. Clinch, engineer and manager, "Electric House," Castle Square (deposit £1 1s.).

June 15th. Corporation. One 27-panel, single bus-bar, metal-clad, draw-out type switchboard for the Southwick power station. (May 29th.)

Chichester.—June 8th. Town Council. Two vertical spindle, electrically driven, sewage pumps (capacity 240 and 480 gal. per minute respectively) for the Fishbourne pumping station. F. R. Dinnis, city engineer, County Offices, North Street.

Clydebank.—June 10th. Town Council. Various works, including electrical, in 458 houses at North Kilbowie housing estate. Town clerk, Municipal Buildings (deposit £1).

Croydon.—June 15th. Electricity Department. Stores and materials for twelve months. (May 22nd.)

Douglas (I. of M.).—June 26th. Electricity Undertaking. 3,750-kW turbo-alternator, &c. (May 29th.)

Dundee.—June 8th. Corporation. Electric lighting installation at Westgreen Mental Hospital. City quantity surveyor, 21, City Square.

East Riding.—June 22nd. County Council. Replacement of existing heating boilers at the County Hall, Beverley, by (a) low-pressure hot-water boilers for various methods of firing, or (b) electrical thermal storage. County architect, County Hall, Beverley (deposit £2 2s. each).

Edinburgh.—June 11th. Education Department. Electrical installations at David Kilpatrick, Castle Hill, Yardheads and Bruntsfield schools. City Architect's Office.

Egypt.—ALEXANDRIA.—June 27th. Ports and Lighthouses Administration. Electrification of the Port of Alexandria (3rd section). Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1 (deposit £2 1s., not returnable).

Epsom and Ewell.—June 15th. U.D.C. Electricity Department. Steel kiosk, h.v. switchgear, transformer, l.v. cable and multiple stoneware conduits. (May 22nd.)

Erith.—June 23rd. U.D.C. Electricity Department. Three 500-kVA three-phase, outdoor type transformers, l.v. distribution panels and h.v. switches for sub-stations; alterations to main cabling at Walnut Tree Road Station; and cable for l.v. main connections at sub-stations. (See this issue.)

Fife.—June 16th. County Council. Electric lamps for schools, hospitals, &c. G. Sandilands, County master of works, Property and Works Department, Education Offices, Wemyss-field, Kirkcaldy.

June 10th. Electric lighting work at alterations and additions at Crosshill Police station. G. Sandilands (deposit £1 1s.).

Gainsborough.—June 13th. Electricity Department. One 400-kVA, 6,600/400-V transformer. (May 29th.)

Gellygaer.—June 26th. U.D.C. E.h.v. and l.v. cables, steel kiosk, h.v. switchgear, transformer, copper conductors, wood poles and meters. (See this issue.)

Glasgow.—June 13th. Clyde Navigation Trustees. Electrical stores for six or twelve months. Stores superintendent, No. 1 Graving Dock, Govan.

Irish Free State.—DUBLIN.—June 19th. Corporation. Electrically driven sewage pump at the main pumping station, Pigeon House. City engineer, 28, Castle Street (deposit £2 2s.).

June 18th. Commissioners of Public Works. Central heating, hot water, cooking and electrical equipment at Colaiste Eirne, Galway. T. Cassedy, Office of Public Works (deposit £3).

June 19th. Electricity Supply Board. Meters during one year commencing September 1st next. (May 29th.)

Jarrow-on-Tyne.—Town Council. Electric lighting in 150 houses. Borough engineer, Town Hall.

Kirkcudbright.—June 12th. County Council. Electric lighting in Burnside House. County clerk, County Offices.

Leyton.—June 19th. Corporation. Removal of existing fittings, re-spacing and wiring and re-instating the electric lighting installations at two schools. (May 22nd.)

Lincoln.—June 6th. Electricity Department. One 300-Ah accumulator battery. (May 22nd.)

London.—METROPOLITAN WATER BOARD.—June 19th. Four oil engines with centrifugal pumps and electrical generators, two electrically and one water turbine driven borehole pumps, two booster pumps, switchboard and appurtenant works at the Orpington pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, London, E.C.1 (deposit £2 2s. to the accountant).

June 15th. Electric lamps for twelve months commencing August 1st next. Chief engineer, Room 171, 173, Rosebery Avenue, London, E.C.1.

Commissioners of H.M. Works. June 19th. Steel conduits and fittings for electric wiring. (See this issue.)

Manchester.—June 8th. Waterworks Committee. Two electrically driven, multi-stage, centrifugal pumps with automatic switch and control gear, pipes, valves, &c., for erection at Wythenshawe. Chief engineer, Waterworks Offices, Town Hall (deposit £1 1s.).

June 10th. Electricity Committee. 6,600-V single conductor cable for the Stuart Street power station and/or the High Street stores, Chorlton-on-Medlock. (May 29th.)

June 20th. Fire extinguishing equipments at the Barton and Stuart Street stations, electric passenger and goods lift for the Barton power station and three 250-kW mercury-arc rectifier equipments for sub-stations. (See this issue.)

Middlesex.—June 17th. County Council. Electrical installation at the new County School, Pinner. (May 29th.)

July 1st. Electric lighting, road lighting, power, clocks, bell systems, telephone, fire alarms, lightning conductor, distribution cables and switchgear at the Chase Farm schools, Enfield. (May 29th.)

July 6th. Electrical installations comprising distribution cable, lighting, power, clocks, ward and staff signalling systems, and heating and cooking at the Hillingdon County Hospital extensions. (See this issue.)

Newcastle-upon-Tyne.—June 12th. Transport and Electricity Committee. One 200-kVA, 3-phase, 6,600/440-V, 50-cycle transformer. (May 29th.)

Newton Abbot.—June 20th. U.D.C. Rewiring for electric lighting of 314 houses on the Broadlands housing estate. (See this issue.)

New Zealand.—WELLINGTON.—July 7th. Public Works Department. Diesel-electric generating set and switchgear. (T.Y. 30281.)* One deep well pump with electric motor-driven power head, automatic starter, &c. (T. 30280.)*

NEW PLYMOUTH.—August 27th. Harbour Board. One 2-ton electric level luffing, portal, travelling jib crane and spares. (T. 30279.) *

Northern Ireland.—BELFAST.—June 6th. Electricity Committee. High temperature furnace bricks. (May 22nd.)

June 13th. Steam pipework, armour-clad switchgear, static transformers and town water service main. (May 29th.)

June 23rd. Town Council. Closed circuit, self-testing, code signalling street fire alarm system, comprising 110 call points with associated apparatus at headquarters and branch stations. Chief Officer, Fire Brigade Headquarters.

Nottingham.—June 9th. Electricity Committee. General stores for twelve months from July 1st, 1936. (May 22nd.)

Pelton (Co. DURHAM).—Parish Council. Extension of the public street-lighting system. G. Walden, clerk, Council Offices, Newfield.

Poole.—June 13th. Town Council. Electrically driven centrifugal unchokeable type sewage pumps (400 gal. lift against a head of 100 ft.), with motors in duplicate, for the Wallisdown sewerage. E. J. Goodacre, borough engineer, Municipal Buildings (deposit £1 1s.).

Sheffield.—July 1st. Electricity Committee. Steam and water piping, including steam receivers, valves, &c., for the Neepsend generating station. (May 29th.)

Southampton.—June 9th. Electricity Department. Meters. (May 29th.)

South Africa.—CAPE TOWN.—July 1st. Electricity Department. 2,000 25-A single-pole, ironclad service cut-outs. (T.Y. 30271.)* Street lighting fittings and spares, fly fuses, line taps, insulators, &c. (T. 30272.)*

Southport.—June 10th. Town Council. Electrically driven centrifugal pump, rotary air compressor and steam heater, including starter, switches, cables, &c., at the Victoria Baths. A. E. Jackson, borough engineer, Town Hall.

Stoke-on-Trent.—June 8th. Sewage Purification Department. Electrically driven vertical spindle type pumping plant for extensions and alterations to Hanford sewage pumping station (No. 1) and Austin Street ejector station (No. 2). City sewage engineer, Leek Road (deposit £2).

Stretford.—June 15th. Corporation. Sewage, storm water and sludge pumps with electric motors, starters, &c., and screening plant, grab and gantry. E. Parker, borough engineer (deposit £2 2s.).

Sutton Coldfield.—June 17th. Electricity Committee. E.h.v. and l.v. switchgear, transformer kiosks and transformers. (See this issue.)

Tredegar.—June 20th. U.D.C. Pole lines, underground cables, switchgear, and a 250-kVA transformer. (May 29th.)

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birkenhead. — Watch Committee. Accepted. Fourteen Wembley type street lanterns (£270).—G.E.C.

Electricity Committee. Accepted. Thirteen switch units (£1,110).—G.E.C. Installations under assisted scheme: Forty-nine houses (£204).—L. W. Bryan. Seventy-eight houses (£314).—Park Electrical Co.

Coventry.—City Council. Accepted. Switchgear (£3,024).—Ferguson Pailin, Ltd. Concrete cubicles and sanding equipment (£2,917).—W. Lucy & Co. Transformers (£3,900).—Electric Construction Co.

Eccles.—Electricity Committee. Accepted. Two 500-kVA transformers (£461).—Ferranti, Ltd. Two ring-main control units (£210 each).—A. Reyrolle & Co.

Eyemouth.—Town Council. Accepted. Electric lighting in thirty-two houses (£129).—Goodwin, Smith & Co. (Glasgow).

Glasgow.—Electricity Committee. Accepted. Seven 6,000-kVA transformers (£13,918).—Bruce Peebles & Co.

Health Committee. Accepted. Electrical fittings during one year.—G.E.C.

Housing Committee. Accepted Electrical fittings and cables.—Mersey Cable Works, Ltd.; British Electl. and Mnfg. Co.; G.E.C. Electrical installations in 108 houses in Carlisle Street (£485).—Goodwin, Smith & Co.

Irish Free State.—WEXFORD.—County Board of Health. Accepted. Electrical installation at Grianan Charmain (£1,593).—Keating & Gaule.

Leeds.—Housing Committee. Accepted. Electrical installation at houses on the Gipton estate: Allenby & Stokell (£991); Santone Electrical Co. (£2,131); G. E. North & Co. (£3,323).

Health Committee. Accepted. Ten-cwt. electric truck (£156).—Greenwood & Batley, Ltd.

Electricity Committee. Accepted. Further switchgear extensions at the power station (£21,309).—Ferguson Pailin, Ltd. Cables.—Edison Swan Cables, Ltd. (£1,736); Henley's (£968); Macintosh Cable Co. (£625); Telegraph Const. and Maint. Co. (£558); Derby Cables, Ltd. (£161).

London.—HAMMERSMITH.—Electricity Committee. Recommended. Twenty-five 2,200-V, single-phase, metal-clad switchgear units with a rupturing capacity of 50,000-kVA.—J. G. Statter & Co., Ltd. Four new switches for the main switchboard at the generating station (£666).—Harland Engineering Co. Modification of five switches on the main switchboard (£591).—G.E.C.

POPLAR.—Electricity Committee. Accepted. Motors and switchgear (£531).—English Electric Co.

STOKE NEWINGTON.—Electricity Committee. Recommended. Electrical wiring of staircases, courtyards, and administrative quarters of flats in Coronation and Imperial Avenues (£176).—W. B. & H. C. Cables, Ltd.

POST OFFICE.—Accepted. 7½ tons of non-corrosive cored solder.—Ormiston's Alumina, Ltd.

Malvern.—U.D.C. Accepted. Electrical wiring at the Moorlands Road depôt.—A. F. Evans, Ltd. Alterations and replacement of consumers' lamps and apparatus in connection with the change-over.—A. F. Evans, Ltd.; Hall Bros. (Malvern).

Middlesex.—Health Committee. Accepted. Electrical installation at Isleworth casual wards (£594).—G. A. Weston. This was the lowest of six tenders, the highest being £707. Electrical installation at Redhill hospital:

	£
Building & Colliery Supply Co. (Recommended)	**15,095**
Constable, Hart & Co.	15,870
B. French, Ltd.	16,104
J. Kilpatrick & Son	16,503
T. Clarke & Co.	16,695
Read & Partners, Ltd.	16,802
Colston Electrical Co.	16,948
Edmundsons Electricity Corporation	17,080
J. Hunter & Co.	17,176
Samuel Reed & Sons	17,510
Wiring, Ltd.	20,388

Accepted. Main h. and l.v. cables at Harefield Sanatorium (£476).—Pirelli, Ltd.

Forthcoming Events

Incorporated Municipal Electrical Association.—Monday, June 8th, to Saturday, June 13th. Convention in Edinburgh.

Institution of Electrical Engineers.—Monday, June 15th, to Saturday, June 20th. Summer meeting in Scotland.

London Students' Section.—Saturday, June 13th. Summer visit to the Rothamstead all-electric farm, Harpenden.

Hampshire Sub-Centre.—Thursday, June 18th. Summer visit to the Portsmouth electricity undertaking and Shippam's potted meat factory, Chichester.

South Midland Centre.—Tuesday, June 30th. Summer meeting. Visit to the works of the British Thomson-Houston Co., Rugby, and inspection of the Shakespeare Memorial Theatre, Stratford-on-Avon.

Oxy-Acetylene Welding Congress.—Monday, June 8th, to Saturday, June 13th. Caxton Hall, London, S.W.1.

Institution of Mechanical Engineers.—Tuesday, June 9th, to Friday, June 12th. Summer meeting at York.

Institution of Civil Engineers.—Wednesday, June 10th. Institution, London, S.W.1. Annual conversazione. Tuesday, June 16th. Institution, London. "The Development of the Sao Paulo Hydro-Electric Scheme." Mr. A. W. K. Billings.

Tramways, Light Railways and Transport Association.—Wednesday, June 10th, to Friday, June 12th. Annual congress at Brighton.

Chemical Engineering Congress.—Monday, June 22nd, to Saturday, June 27th. Central Hall, London, S.W.1.

Institution of Heating and Ventilating Engineers.—Monday, June 22nd, to Wednesday, June 24th. Cliftonville, Margate. Summer meeting. "Heating Research." Mr. A. F. Dufton.

Notes

Radio Interference

As a result of tests and investigations carried out at the Post Office Research Laboratories and by the British Electrical and Allied Industries Research Association, methods of elimination of radio interference caused by most types of apparatus can now be recommended. The International Committee on Radio Interference has laid down certain standard values to which radio interference should be reduced. The Post Office is therefore desirous of recommending to owners and manufacturers of electrical products suppressors for general application to all types of apparatus, which will reduce the disturbance to the agreed value. With this end in view, manufacturers throughout the country are being approached by the Post Office for facilities to carry out tests on their products at their works. The tests will be commenced shortly by a trained staff of the Post Office Engineering Department, who will be equipped with the necessary measuring apparatus.

Technical Education

Traditional views of cultural study and occupation are insufficient; the realities and tendencies of the present age demand that increasing attention should be given to "technical education," in respect of teachers, methods, equipment and buildings. Such was the theme of the presidential address delivered by Mr. W. Tolme Maccall, M.Sc., M.I.E.E., of the Technical College, Sunderland, at the annual conference at Plymouth this week of the Association of Teachers in Technical Institutions. Educational authorities, he said, had been and were trying to prevent a shortage of skilled workers. They hoped for the co-operation of industry, which fear as well as lack of information had prevented. With a few honourable exceptions employers had feared that the colleges were training all to be works managers, and trade unions feared that colleges were short-circuiting apprenticeship and providing cheap labour. Methods of recruitment and conditions of service must be revised. Each section of industry should decide what types and grades were needed, and the normal annual numbers required. Then, in proper conjunction with the Board of Education, local education authorities could ensure that provision would be made.

Technical bias in secondary schools did not endow them with the qualities of a technical institution. Purely external examinations were terribly faulty as tests of merit: their failings were known, but few suspected their serious nature. Teachers who worked under National Certificate conditions were increasingly determined to oppose anything that could detract from the importance of these certificates.

American Electrical Convention

The American I.E.E. is holding its summer convention this year at Pasadena, California, from June 22nd to 26th. Over forty papers are to be discussed.

Appointments Vacant

Borough electrical engineer for Kingston-on-Thames.

Deputy electrical engineer for Hammersmith Electricity Department.

Meter and installation assistant for Basingstoke Electricity Department.

Showroom assistant (male) for Cheltenham electricity undertaking.

Installation inspector and meter tester for Bingley Electricity Department.

Assistant lady demonstrator for Exeter electricity undertaking.

Test-room assistant for Hull Electricity Department.

Junior assistant development engineers for Brighton Electricity Department.

Electrical engineering assistants for the Air Ministry.

Assistant power station chemist for Bradford Electricity Department.

Consumers' clerk and a general clerk for Doncaster Electricity Department.

Assistant mains superintendent for the War Department.

Electric traction engineer for the South Indian Railway Co., Ltd.

Assistant Grade I in the Air Ministry Scientific Research Pool, South Farnborough.

Temporary charge engineers and switchboard attendants at the Fulham power station.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

MARITIME & SEACONE G.B. navigation lamps.

TOXITE 114 compound.

STOKES automatic water still.

PINOT tailor's iron.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. A. G. Robiette, B.Sc., the author of the article on "Electric Brazing" on page 816, is a first-class honours graduate in metallurgy of Swansea University College. He was employed for 5½ years as a metallurgist with the Electric Furnace Co., Ltd., and the Electric Resistance Furnace Co., Ltd. He was afterwards appointed chief metallurgist to Birmingham Electric Furnaces, Ltd., and is the author of a recently published textbook "Electric Melting Practice."

[Logan, Birmingham
Mr. A. G. Robiette

Mr. G. V. Harrap, who is a graduate member and a member of the Transmission Section of the I.E.E., and an associate of the American I.E.E., was married in Manchester on May 30th to Miss M. Walmsley. Mr. Harrap was apprenticed to the Metropolitan-Vickers Electrical Co., Ltd., and has held positions on the supply side in Manchester, Dundee and Newcastle, having just left the last undertaking to take up another appointment. Miss Walmsley is a member of the Manchester branch of the E.A.W.

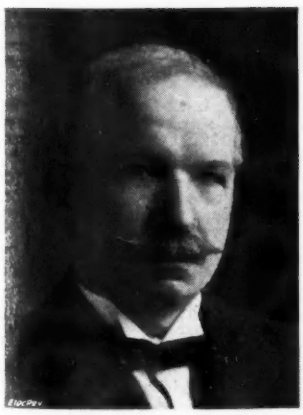
Mr. W. Hodson, the present assistant engineer at Aberdeen, has been recommended by the Electricity Committee for the appointment of city electrical engineer in succession to Mr. J. A. Bell. Mr. Bell was due to retire a few weeks ago, but, at the request of the Committee, he has agreed to carry on until the appointment of his successor has been confirmed. Mr. Hodson, who is a native of Sussex, joined the staff of the Electricity Department in 1903 in the test room and drawing office. During the War he served in the Royal Sussex Regiment and the Tank Corps. On his return to civil life he re-entered the service of the Electricity Department as chief technical assistant, a position which he still occupies, in conjunction with that of assistant engineer.

Mr. H. Hobson has agreed to continue as president of the Association of Supervising Electrical Engineers for a further year. Mr. Hobson, who is general manager of the Central Electricity Board, will deliver his presidential address to the Association in October next on his return from the World Power Conference in America, at which he is submitting a paper on "Integration of Electric Utilities in Great Britain."

Mr. O. G. Cook, chief electrical engineer and manager to the Bingley Urban District Council, has been elected president of the Bingley Rotary Club.

Mr. G. F. Shotter, of the North Metropolitan Electric Power Supply Co., has been nominated for the chairmanship of the Meter and Instrument Section of the Institution of Electrical Engineers for the 1936-37 session.

Mr. B. S. Hornby, chief asssistant engineer on the staff of Bolton Corporation Electricity Department, is resigning through ill-health, and the committee has placed on record its appreciation of his services during his thirty-seven years with the department.



[Lafayette
Mr. H. Pool

Mr. H. Pool, general manager of the Leicester Corporation Passenger Transport Department, has resigned on the grounds of permanent ill-health. Mr. Pool, who is sixty years of age, has been in the tramways service for forty-six years. He joined the old company as a junior clerk in 1890, and when it was taken over by the Corporation in 1901 he became chief clerk. Three years later he was appointed chief accountant and in 1926 was made assistant general manager. In 1928 he succeeded Mr. A. F. Lucas as general manager.

Mr. W. H. Price, of Caroline Street, Birmingham, announces that he has relinquished his appointment as Midland area manager for the General Accessories Co., Ltd., of London.

Mr. J. Watson Deans, of Edinburgh, was elected president of the Electrical Contractors' Association of Scotland for the ensuing year at the annual meeting and conference of the Association which was held on May 22nd (a report of which appears on page 828). Mr. H. M. Fulton, of Glasgow, was elected vice-president.

Mr. J. Watson Deans

Mr. J. C. Williams, the retiring electrical engineer to the Erith Urban District Council, has been presented by the staff and employés with an inscribed grandfather clock.

On the occasion of his forthcoming marriage, **Mr. J. Smith,** district engineer of the Clyde Valley Electrical Power Co., was honoured at a large gathering of officials and employés at Blairhill, Lanarkshire, on May 28th. Mr. R. Stewart, assistant engineer, presided, and Mr. Roxburgh, distributing engineer, presented Mr. Smith with a cabinet, a grandfather clock, and other gifts.

Mr. A. J. Shepherd, installation inspector with the Bingley Urban District Council Electricity Department, has been appointed consumers' engineer to the Colwyn Bay Corporation Electricity Department.

Mr. E. A. Corrall, South Midland representative for Messrs. Gittings & Hill, Ltd., has just completed fifty years' service with the company.

Mr. N. R. Rice, B.Sc.(Eng.), has been elected chairman of the London Students' Section of the Institution of Electrical Engineers.

Mr. R. F. Markham, the author of the article on "Rural Transmission Voltages," which appears on page 810, has been on the engineering staff of Messrs. Johnson & Phillips, Ltd., for the past seventeen years, being mainly responsible for their transmission work. (At the present time the company has in hand 100 miles of 132,000-V and 66,000-V lines for the Central Electricity Board as well as a record amount of low-voltage lines). Before joining Messrs. Johnson & Phillips he was engaged on the electrification of the London, Brighton and South Coast Railway on the staff of Sir Philip Dawson, consulting engineer to the railway.

Mr. R. F. Markham

Mr. William Davies was appointed electrical engineer and manager to the Tredegar Urban District Council at a meeting of the Council last week. He joined the department in 1934 and became deputy electrical engineer in the following year.

Obituary

Mr. R. F. Botting.—The death occurred in a Johannesburg nursing home on May 10th, at the age of sixty-two, of Mr. Robert Frederick Botting, A.M.I.E.E., a director of Messrs. Hubert Davies & Co., Ltd., of Johannesburg. Mr. Botting gained his electrical experience in England and Ireland, and went to South Africa in 1901 as a volunteer in the Electrical Engineers (R.E.). He joined Messrs. Hubert Davies & Co., in 1908, and when the firm became a limited liability company in 1917 he was appointed a director. He was a past-president of the S.A. Institute of Electrical Engineers.

Sir Archibald Denny, Bt.—We regret to announce the death of Sir Archibald Denny, Bt., a director of Messrs. William Denny & Bros., Ltd., which occurred on May 29th at the age of seventy-six. Sir Archibald was a past-president of the Institution of Junior Engineers. He was also chairman of the British Engineering Standards Association from 1918 to 1927.

Mr. P. Carrick, chief inspector of train lighting to the L.N.E. Railway Co., Cowlairs Works, Glasgow, died recently at his home at Bishopbriggs, near Glasgow.

Mr. W. A. Parker.—We regret to announce the death of Mr. William Alfred Parker, borough electrical engineer and manager of Workington, which occurred on May 26th at his home in Workington, at the age of thirty-four years. Mr. Parker was previously on the staff of the Rotherham Corporation Electricity Department, and in 1924 was appointed distribution engineer at Workington on the inauguration of electricity supply in the borough, becoming engineer and manager in 1929.

Mr. W. A. Parker

Mr. H. O. Eurich.—The death of Mr. Herman Oskar Eurich occurred at Rugby on May 27th, at the age of sixty-one. During the last thirty years or so Mr. Eurich had been in the employ of the British Thomson-Houston Co., Ltd. A native of Chemnitz, Germany, he was educated at Bradford Grammar School. After being engaged in research work he returned to Germany as an apprentice with Messrs. Schwarzkopf & Co., Berlin. Later he returned to England and entered the service of a Bradford firm, leaving in 1901 to join Messrs. Campbell & Isherwood, Liverpool, as a design engineer on small a.c. and d.c. motors. Five years later he entered the service of the British Thomson-Houston Co., and subsequently became assistant-in-charge in the design of d.c. machines up to about 100 h.p. This position he held until the time of his death. He was closely associated with the design of various types of d.c. motors developed by the company during the last twenty years.

Mr. H. W. Angus.—We learn with regret of the death of Mr. H. W. Angus, engineer and manager of the Eccles Corporation Electricity Department, which occurred on June 1st. A service was held on Wednesday last at the Manchester Crematorium.

Wills.—Sir Joseph Ernest Petavel, K.B.E., D.Sc., F.R.S., Director of the National Physical Laboratory, left £61,161, with net personalty £43,023. He left his effects not otherwise disposed of to the Royal Society, desiring that the Director of the National Physical Laboratory should be allowed to have the use and enjoyment of them so long as his residence shall be at Bushy House, and the residue of the property he left to the Royal Society absolutely, for the benefit of the Director of the National Physical Laboratory.

Mr. G. W. Williams, a director and sales and advertising manager of the British Vacuum Cleaner & Engineering Co., left £14,212, with net personalty £13,684.

Mr. A. J. Howard, borough electrical engineer, Taunton, left £8,918 (net personalty £2,992).

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

H. J. Baldwin & Co., Ltd.—Private company. Registered May 27th. Nominal capital, £100. Objects: To carry on business as manufacturers of and dealers in all classes of protection covers for cables, pipes, conduits and ducts; manufacturing engineers; manufacturers of and dealers in electrical apparatus, patent cable and pipe connections, &c. The directors are: H. J. D. L. Walmsley (chairman), Hazel Grove, Mapperley, Notts; and E. A. Donaldson, 109, Selby Road, West Bridgford, Notts. Secretary: F. Chambers, 98, Nuthall Road, Kimberley, Notts. Solicitors: Browne Jacobson & Haslam, 44, Friar Lane, Nottingham.

New Beam Anti-Dazzle Light Co., Ltd.—Private company. Registered May 27th. Capital, £1,000. Objects: To acquire any patents and rights, and to carry on the business of motor, mechanical, electrical and general engineers, manufacturers of and dealers in motor and other vehicles, lamps, batteries, accumulators, magnetos and other accessories, &c. The first directors are: W. G. Reeves, 67, Darcy Road, Norbury, S.W. (chairman), and two others. Solicitors: L. O. Glenister & Sons, 20-22, King Street, Hammersmith, W.6.

Gemosigns, Ltd.—Private company. Registered May 28th. Capital, £2,000. Objects: To acquire from Geo. Moss his inventions and patent rights relating to illuminated signs, and to carry on the business of manufacturers of and dealers in electrical, luminous and other signs, &c. The subscribers are: G. Moss, 4, Old Park Road, Enfield, N.; and J. Patterson, 10, Coleman Street, E.C.2. Solicitors: Wylie Patterson & Herring, 10, Coleman Street, E.C.2.

International Telephone Diallers, Ltd.—Private company. Registered May 28th. Capital, £5,000. Objects: To carry on the business of manufacturers and vendors of telephones and telephone equipment and accessories, &c. The directors are: J. Richardson, 49, Halford Road, Richmond, Surrey; and J. C. H. Kilner, "The Drive," Boulters Lock, Maidenhead, Berks. Registered office: 10, Lower John Street, Golden Square, W.1.

Accumulators "Elite," Ltd.—Private company. Registered May 22nd. Capital, £3,000. Objects: To acquire the business of an accumulator manufacturer carried on by C. T. Rhodes at Hebble Mills, Salterhebble, Halifax, as Accumulators "Elite." The directors are: C. T. Rhodes (permanent governing director), Ashday Hall, Southowram, Halifax, and three others. Registered office: Hebble Mills, Salterhebble, Halifax, Yorks.

Premier Electric Services, Ltd.—Private company. Registered May 28th. Capital, £1,400. Objects: To carry on the business of electrical contractors and manufacturers and suppliers of and dealers in and agents for electrical accessories and parts, &c. The subscribers are: G. H. Sexton, "Glencoe," Stoughton Road, Oadby, Leics.; and D. Richardson, 81, Newport Street, Leicester.

Returns of Electrical Companies

County of London Electric Supply Co., Ltd.—Particulars filed of debenture stock to secure £8,000,000 (inclusive of £5,500,000 already registered), authorised by resolutions dated April 25th, 1927, to April 21st, 1936, and covered by trust deed dated April 30th, 1936 (supplemental to trust deeds dated May 19th, 1927, to February 4th, 1932), charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,500,000. Trustees: Electric & General Investment Company, Ltd., and Law Debenture Corporation, Ltd.

Victoria Falls and Transvaal Power Co., Ltd.—Satisfaction in full on May 21st, 1936, of (a) trust deed dated September 20th, 1907, and supplemental deeds dated February 18th, 1910, and July 27th, 1911, and registered March 6th, 1930, securing 5 per cent. first mortgage debentures series "A," "B" and "C"; and (b) trust deed dated May 2nd, 1912, and registered March 6th, 1930, securing 5½ per cent. second mortgage debentures series "A" and "B."

Building Centre, Ltd.—First mortgage debenture, dated May 13th, 1936, to secure £12,000, charged on 158a and 158b, New Bond Street, and 18, Barlow Place, W., and the company's other property, present and future, including uncalled and unpaid capital. Holders: Westminster Bank, Ltd. (By deed dated May 12th, 1936, the debentures registered August 23rd, 1932, have been postponed to the above.)

Television Demonstrators (Blackpool), Ltd.—Capital, £2,000 in £1 shares. Return dated October 14th, 1935 (filed March 2nd, 1936). 1,500 shares taken up. £950 paid. £550 considered as paid. Mortgages and charges, nil.

Rexvia Radio, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1935 (filed January 14th, 1936). 230 shares taken up. £230 paid. Mortgages and charges, nil.

Aladdin Radio Patents, Ltd.—Capital, £100,000 in £1 shares. Return dated December 31st, 1935 (filed March 10th, 1936). Five shares taken up. £5 paid. Mortgages and charges, nil.

Ray Mouldings, Ltd.—Debenture dated May 8th, 1936, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: C. A. Mason, Chigwell Row, Chigwell.

Caledonian Electric Services, Ltd.—Debenture dated May 7th, 1936, to secure £200 charged on the company's property, present and future, including uncalled capital. Holder: R. J. Mogridge, 7, Lionel Mansions, Brook Green, W.14.

Ero Condenser Co., Ltd.—Debenture dated May 14th, 1936, to secure £100 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London and District Loan Corporation, Ltd., 88, Chancery Lane, London, W.C.2.

Concordia Electric Safety Lamp Co., Ltd.—Satisfaction to the extent of £14,200 (amount issued) on May 12th, 1936, of 5½ per cent. debentures authorised March 19th, 1934, and registered April 10th, 1934, securing £40,000.

F. & D. Robinson (Warlingham), Ltd.—G. A. Smith, of 110, Cannon Street, E.C., was appointed receiver and manager on May 20th, 1936, under powers contained in instrument dated May 11th, 1936.

Salora Lights, Ltd. (formerly Aurora Lights, Ltd.).—E. T. Peirson, of 16/17, Hertford Street, Coventry, ceased to act as receiver and manager on May 19th, 1936.

Resistoid, Ltd.—The nominal capital has been increased by the addition of £8,000 in £1 ordinary shares beyond the registered capital of £2,000.

St. Austell and District Electric Lighting and Power Co., Ltd.—The nominal capital has been increased by the addition of £50,000 beyond the registered capital of £60,300. The additional capital is divided into 40,000 4½ per cent. cumulative second preference and 10,000 ordinary shares of £1 each.

Gold Coast & Ashanti Electric Power Development Corporation, Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1935 (filed April 16th, 1936). 300 shares taken up. £300 paid. Mortgages and charges, nil.

City Notes

Edmundson's Electricity Corporation, Ltd., held its annual meeting on June 2nd, when Brig.-Gen. Wade H. Hayes (deputy chairman and managing director), who presided, said that during the year they had added 42,900 new consumers, bringing the total up to 301,000. The connected load was increased by 114,000 kW, making a total of 789,000 kW, while sales of electricity rose by 73,000,000 to 536,017,000 kWh. During the first four months of 1936 there had been an increase of 22 per cent. in kWh sold, as compared with the corresponding period of last year. The policy of co-ordinated control of direction and operation of all companies in the Edmundson group, initiated three years ago, had necessitated many changes in organisation and methods of procedure, and this had now been accomplished. During the three years the gross capital expenditure of the associated companies was increased by £4,775,000, the number of villages and townships connected to the distribution network by 781 (with a total population of 305,000), and the overhead and underground mains erected or laid measured 3,200 miles. The number of consumers served rose from 181,000 to 301,000, an increase of 66 per cent., the sales from 324,000,000 to 536,000,000, and the connected load from 504,458 to 788,755 kW. The rate of expansion was about 50 per cent. in excess of the average for the entire country. With regard to the future, with a reasonable continuation of the present industrial and business momentum they were justified in anticipating the continued expansion in this country of the electrical industry in general and their company in particular. In their group there were 99 separate companies, and the ideal situation would be to have the entire group consolidated into one company, but until there were many changes in the existing Acts of Parliament this would not be possible. They now had before Parliament a Bill to consolidate the numerous small companies which they controlled in Cornwall, and if this Bill received Parliament's consent all the companies in that county would be merged in one, bringing about efficiency and economies which would result in better and cheaper service to the consumer.

The Chloride Electrical Storage Co., Ltd., held its annual meeting on May 29th, when Mr. W. S. Naylor (chairman), who presided, referred to the extensions of the works, and said it was hoped they would be fully occupied in a few months' time. With regard to the "Exide" battery its application to emergency uses was widespread. Installations had been carried out on the *Queen Mary* for the emergency radio, the starting of oil engines in connection with the emergency electric generators, and for the operation of telephone equipment. It was widely used in trolley-buses, and some 300 hospitals in Great Britain, as well as a large bank and a lighthouse, were equipped with the "Keepalite" emergency system. Special installations included one in a public laboratory where important bacteriological tests were carried out, and another application was the maintenance of lighting in factories. The popularity of the electric vehicle was still growing, and during 1935 over 600 electric trade vehicles were registered for the first time, mainly for house-to-house delivery. It was a significant fact that in many cases, after initial experiment, an electric fleet had been built up. The question of health in the industry was an important one, and during the past eight years they had employed a whole-time medical man, the number of accidents involving loss of time had been halved, while in the matter of occupational sickness their record was still more remarkable. Lead poisoning had been totally eliminated from their factories. He was optimistic regarding the company's future. It stood on a foundation of great intrinsic strength, and depended for its income on a large and varied volume of business producing a small average rate of profit.

Allen West & Co., Ltd.—The company has issued details of a scheme of capital reconstruction. The present authorised and issued capital is £700,000 divided into 300,000 7 per cent. cumulative participating preference shares of £1 each and 400,000 ordinary £1 shares. Preference shareholders are asked to accept eighteen 1s. ordinary shares for each £1 preference share now held, and to agree to the cancellation of all arrears of preference dividend, which at July 1st, 1936, will amount to £105,000. Ordinary shareholders are asked to accept five 1s. ordinary shares for each £1 ordinary share held. The 1s. shares will be consolidated into 5s. shares and the capital of the company will then be £370,000 divided into 1,480,000 shares of one class. If the scheme is approved preference shareholders will receive 1,080,000 of the 5s. shares. Meetings to consider the scheme will be held on June 24th.

The British Electric Traction Co., Ltd., reports a revenue of £505,246 for the year ended March 31st last, as compared with £465,514 in the preceding year. After deducting general expenses, income tax, &c., and charging debenture interest, there is a balance of £331,600. The final dividend on the preferred ordinary stock is 4 per cent., making 8 per cent. for the year, and on the deferred ordinary shares 2½ per cent., making 5 per cent. Subject to the deferred ordinary dividend, the preference stock is entitled to a further dividend of 2 per cent., making a total dividend of 8 per cent. for the year. It is also proposed to capitalise £54,010 and distribute it to deferred ordinary holders in fully paid deferred ordinary shares of £1, such shares to be converted subsequently into deferred ordinary stock.

The East African Power & Lighting Co., Ltd.—The annual general meeting was held in Nairobi on May 28th. Captain H. F. Ward (chairman), who presided, said that during the year under review 9,770,000 kWh was sold in Kenya, an increase of 9 per cent. over the preceding year, at an average rate of 23.5 cents per kWh, as compared with the sale in 1925 of 1,500,000 kWh at an average price of 56.2 cents per kWh. In the past six years the average price paid by consumers had dropped from 36.3 cents to 23.5 cents per kWh, while there had been no addition in the rate of dividend paid to the shareholders. The connected load of electrical apparatus at the end of 1935 totalled 17,200 kW, an increase of 1,310 kW during the year. The next extension of the generating stations in the Nairobi district by the development of the Maragua-Tana hydro-electric scheme was still receiving consideration, and it was hoped to be able to report progress on these lines next year. Business in Tanganyika was expanding.

The Madras Electric Supply Corporation, Ltd., held its annual meeting on May 27th last, when Mr. J. Gray (chairman), who presided, said that during the past year the number of consumers had increased by 8 per cent. and the kWh sold by 11.4 per cent., which was a rise under every heading, while the average price per kWh had fallen from As.1.680 for 1934 to As.1.608. With regard to the plant, it had been necessary to retube the condensers of two of the sets preparatory to dismantling the 6,000-kW set, which was being replaced by one of 15,000 kW. The new set was expected to be in commission by the end of the current year, while new equipment for cooling and purifying the condenser circuit water was approaching completion. An extension of the bulk supply was being made to Allandur. Important reductions had been made in the tariffs which would adversely affect the gross revenue during the current year, but this had been anticipated to some extent by carrying forward an increased balance in the revenue account. They had received a setback in the return on the tramways investment, there having been a considerable falling off in traffic. Large expenditure had been incurred in double tracking and other improvements and every effort was being made to reduce running costs and to effect every economy consistent with efficiency.

The Dubilier Condenser Co. (1925), Ltd.—Presiding at the annual meeting held on May 29th, Mr. G. F. Mansbridge (chairman), said that in the face of severe competition and low prices they had obtained a record turnover coupled with increased productive efficiency. The concentration of all the manufacturing capacity at Acton was now in hand, and would, it was hoped, become effective during 1936-37. Additions to buildings and plant would expand their productive capacity and were being designed to further improve their products. New types of condensers and resistances had been developed during the year. On the sales side world economic conditions limited their overseas trade and prospects of an improvement were slight. The production departments had dealt with enormous quantities at short notice, and the record volume of work had been executed without delay. As to the prospects, they had already more work in hand than at the corresponding date of last year.

The Delhi Electric Supply & Traction Co., Ltd.—Presiding at the annual meeting held on Tuesday last week, Mr. K. A. Scott-Moncrieff (chairman) said that during the year under review the number of consumers connected had risen by 650 to 15,475, against an increase of 813 in 1934. Sales were up by 10 per cent. Traction figures were not so favourable; the passengers carried had fallen by 5 per cent., and the revenue received from them by 11 per cent. Receipts from the tramways decreased by 13 per cent., while a loss was also incurred on the trolley-buses, which started operation at the end of January, and the petrol buses. The street-lighting contract with the Delhi Municipality terminated at the end of March last, and the new contract submitted made considerable reduction in the charges.

Ward & Goldstone, Ltd., report a net profit for the year ended March 31st last of £50,524, from which is deducted directors' fees, income tax, and depreciation, leaving a balance of £34,781. A balance of £23,048 brought in is added, making £57,829. The final ordinary dividend is 10 per cent., making 15 per cent. for the year, and it is proposed to capitalise and issue £7,074 5s. as fully paid ordinary shares of 5s. each, ranking *pari passu* in all respects with the existing ordinary shares. the new shares to be distributed amongst ordinary shareholders in the proportion of one share for every ten held. Reserve receives £10,000, and £28,254 is carried forward.

The General Electric Co., Ltd., is holding an extraordinary meeting on June 25th at which resolutions will be submitted for cancelling all special restrictions as to the transfer and issue of the British ordinary shares. The directors are of opinion that the reasons for these restrictions have ceased to exist, and they consider that there is now no necessity for having two different classes of ordinary shares. It is also proposed to convert the whole of the issued preference and ordinary shares into preference and ordinary stock.

The Southern Areas Electric Corporation, Ltd.—Particulars are published in our advertisement pages to-day of an issue of 450,000 ordinary shares of £1 each at 21s. per share, the subscription list for which will open on June 9th.

Mirrlees, Bickerton & Day, Ltd., have announced a dividend of 2½ per cent. on the ordinary shares for the year ended March 31st last (against nil for 1934-35).

Stocks and Shares

TUESDAY EVENING.

IF the weather were of more genial character it might be possible to say that Stock Exchange markets are already beginning to feel the effect of the approach of the holiday season. Seeing, however, that members of the House, when they returned to business on Tuesday, were asking each other how they spent their Christmas this Whitsun, some other reason must be found for the tranquillity of business in stocks and shares and the disinclination on the part of the public to enter the markets in any active fashion.

The iron, steel and allied group is busy, thanks in part to the excellent advertisement afforded it by the success of the *Queen Mary*. Gilt-edged stocks are steady to dull, in House parlance. New issues are being taken none too avidly and, speaking generally, the tone through the markets is one of restraint, tempered by a chastened hopefulness.

Cable and Wireless

Second thoughts on the Cable and Wireless meeting failed to blunt the keen edge of disappointment which cut down

prices of the stocks so drastically last week. It is to be expected that the market will take some time to recover from its disillusionment concerning the hoped-for schemes for dealing with preference dividend arrears, and also with the unbalanced capital structure. The preference stock stands half a point lower at 103, but the "A" and "B" stocks are unchanged on the week. Globe Telegraph Ordinary weakened to 15½ by reason of the company's Cable and Wireless interest.

American Telephone and Telegraph jumped 5 points to 167½. Transatlantic markets are moderately steady. Western Unions, 80, and Radio Corporations, 11¼, are well maintained, but International "Tel. and Tel." eased off to 13½. International Holdings are fractionally lower at 1¾.

Swedish Electrolux at 10⅝, Pressed Steels at 23s. 9d., and Electric and Musical Industries at 25s. are all firmer. Consolidated Signals have gone back to 5.

Home Electricity Supply

There are few movements to record in a stagnant market for Home electricity supply shares. Active interest in the shares is noticeably absent. British Power and Light hardened to 31s. 3d. and West Gloucestershire ordinary is higher again at 129. Newcastles and Llanellys lost ground to 35s. and 25s. respectively. County of London new 3½ per cent. debentures are easier: the stock is now offered at par—the price at which the issue was made. Upon vague suggestions as to the possibility of money rates becoming stiffer, the prices of various prior-charge issues show a slightly reactionary tendency. The Edmundson's meeting, on Tuesday in this week, produced an interesting speech from the chairman, but had no effect upon the price of the shares.

Calcuttas, at 55s. 9d., are looking a little better than they have been lately. Peraks firmed up to 25s. on the negotiations with the Kinta Electrical Company.

Palestine Electricity Shares

Palestine Electric "A" shares were not slow in responding to signs of more settled local conditions. Reliable news from the country is not easily obtained, but it is of a sufficiently reassuring order to attract bargain-hunters and to induce repurchases by those who turned out their holdings at the beginning of the trouble. The price, in consequence, ran up quickly from 45s. 6d. to 48s. 9d. Before the Jew-Arab disturbances broke out the shares were gaining steadily in popularity, a favourable view being taken of the company's future as a participant in the steady progress of many Palestine industries. The quotation has been as high as 57s. 6d. this year.

Jerusalem Electrics hang fire at 35s., about 8s. below the best price reached earlier in the present twelvemonth.

G.E.C.

The rise in the price of General Electric shares stands out as a bright spot against the rather drab background of the electrical equipment market as a whole. Expectation of an excellent report from the company, and generous distributions, in one form or another, to shareholders, are responsible for the quotation being a further half-crown to the good at 83s. There is no reason to doubt that the report, when published, will be equally impressive as that of the Associated Electrical Industries, earlier this year. By analogy alone, therefore, a bigger dividend is taken for granted. The proposal of the board to cancel all special restrictions applying to the British ordinary shares is interpreted by some people as a pointer in the direction of a bonus to shareholders.

The British ordinary shares were created (but never issued) as a measure against control passing into foreign hands. The desirability of such a step arose as a result of huge American purchases of General Electric shares during the boom of 1928. More than half the company's ordinary capital became, at that time, vested in the United States. A block of some 400,000 shares was repatriated by a London group last year at a cost of around £1,200,000.

Manufacturing and Equipment

Business is no less scanty in the electrical equipment market than in most other sections of the House. The tendency for the higher-priced cable shares to droop is still in evidence. Henley's, at 7 1/16 are 3/16 down, following upon last week's fall of ⅛; British Insulated lost half a crown to 5½. Callenders managed to hold their ground. Small declines are shown by English Electrics at 21s. 6d. and Enfield Rolling Mills at 21s. 6d. International Automatic Ordinary at 47s., Telephone Manufacturing at 9s. 9d., and Hall Telephones at 20s. 6d. are all a few pence down. London Electric Wire firmed up to 30s. 6d. Aron Meters are, like the dividend, unchanged.

Miscellaneous Matter

London Passenger Transport Board "C" stock has weakened to 102. With not many more weeks of the financial year to run, the Board's traffic returns do not inspire confidence in the ability of earnings to meet the hoped-for 5½ per cent. dividend. British Electric Traction preferred is 2 points down at 177½. It may answer many inquiries to point out that the deferred stock is quoted ex-dividend, but that the rights to the bonus issue are still included in the price.

Crompton Parkinsons are a good market on news of the Canadian enterprise. Babcock and Wilcox remain rather depressed at 47s. 6d., but Vickers, at 25s. 6d., figure prominently in the more animated market for iron, steel and kindred shares.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend. Previous.	Last.	Price June 2.	Rise or Fall.	Yield p.c. £ s d.
Bournemouth and Poole	1	15	15	77/6	—	3 17 5
City of London	1	7½	7½	37/–	—	4 1 1
Clyde Valley	1	7	8	45/–	—	3 11 1
County of London	1	10½	10½	56/–	—	3 15 0
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 9
Do. Ord.	1	8	8	43/6xd.	—	3 13 7
Elec. Dis. Yorkshire	1	9	9	47/6	—	3 16 7
Elec. Fin. and Securities	1	12½	12½	3 7/16	—	3 12 9
Elec. Supply Corporation	1	11	11	62/–	—	3 11 0
Lancs Light and Power	1	7½	7½	39/–	—	3 17 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	—	4 0 0
London Power Deb. Red.	Stock	5	5	108½	—	4 12 2
Metropolitan	1	10	10	51/6	—	3 17 7
Midland Counties	1	7	7½	41/–	—	3 13 2
Mid. Elec. Power	1	8	8	42/–	—	3 16 2
North Eastern Electric Ordinary	1	6	6	35/–	—	3 8 7
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 5
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	58/9	—	3 8 0
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	43/–	—	3 14 5
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	46/–	—	3 9 7

Public Boards.

Central Electricity, 1950–70	Stock	5	5	118	—	4 4 9
Do. 1955–75	„	5	5	120	—	4 3 4
Do. 1951–73	„	4½	4½	112	—	4 0 4
Do. 1963–93	„	—	3½	102	—	3 8 8
London Elec. Trans. Gtd.	„	—	2½	97	—	2 11 7
London & Home Counties, 1955–75	„	4½	4½	113	—	3 19 8
London Passenger Transport, A	„	—	4½	125½	—	3 11 9
Do. do. B	„	—	5	129	—	3 17 6
Do. do. C	„	3½	4	102	–1	3 18 5
West Midlands Joint Elec. 1948–68	„	—	5	116½	—	4 5 10

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	167½	+5	5 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	125½	—	4 15 7
Do. Def.	„	1½	1½	30	—	5 0 0
Cable & Wireless 5½% Pref.	„	4½	5½	103	–½	5 6 10
Do. A. 7½% Ord.	„	Nil	Nil	23	—	—
Do. B. Ord.	„	Nil	Nil	7	+½	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	15½	–½	2 18 1
Do. do. Pref.	10	6	6	14½	—	4 4 8
Great Northern Tel.	10	20	20	43½	–½	4 12 0
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1550xd	—	—
Do. do. Pref. Ord.	„	8	8	177½xd.	–2	4 10 2
Brazil Traction	100	—	30 cts.	12½	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	102½	—	4 17 7
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	50	—	—
Victoria Falls Ord.	1	20	20	3 11/16	+ 1/16	—
West Riding	1	5	6½	52/6	—	2 9 6

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	63/9	—	4 14 4
Assoc. Elec. Ord.	1	6	8	46/–	—	3 9 7
Do. Pref.	1	8	8	39/–	—	4 2 1
Babcock & Wilcox	1	8	8	47/6	—	3 7 5
British Aluminium Ord.	1	7½	7½	40/–	—	3 15 0
British Insulated Ord.	1	15	20	5½	–½	3 16 2
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4½	—	3 10 7
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	65/–	—	1 0 0
Do. 8% Pref.	1	8	8	2	—	4 0 0
Edison Swan 1st Pref.	1	7½	7½	30/–	—	5 0 0
Electric Construction	1	Nil	3½	1½	—	2 0 0
Enfield Cable Ord.	1	25	25	5½	—	4 15 3
English Electric	1	Nil	Nil	21/6	–6d.	—
Do. do. Pref.	1	Nil	Nil	25/3	—	—
Ericsson Tel.	5/–	24	20*	2½	—	2 4 6
Ever Ready	5/–	35	35	25/6	—	6 17 3
Ferranti Pref.	1	7	7	27/–	—	5 3 8
G.E.C. Pref.	1	6½	6½	32/-xd.	—	4 1 3
Do. Ord.	1	8	10	83/–	+ ½	2 8 2
Henleys	1	30	30	7	– 1/16	4 5 9
Do. 4½% Pref.	5	4½	4½	5½	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	46/3	—	4 6 6
Lancashire Dynamo	1	5	10	2½	—	4 9 0
Siemens Ord.	1	4	6	26/3xd.	—	4 11 5
Telegraph Construction	£1	Nil	Nil	26/3	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1934

22037. "Method of and apparatus for regulating the temperature of electrically heated apparatus." L. L. De Kramolin. July 27th, 1934. (446736.)

22266. "Tapping switches or ratio-adjusting devices for electrical transformers." G. H. Neep and J. L. Rowbotham. July 31st, 1934. (446890.)

22381. "Electrical sound amplifiers." R. D. Carter-Pedler. August 1st, 1934. (446891.)

22415. "Electrodes for high-frequency treatment." Siemens-Reiniger-Werke Akt.-Ges. March 20th, 1934. (Cognate application 22452/34.) (446660.)

22724. "Television transmitting systems." A. D. Blumlein and J. D. McGee. August 3rd, 1934. (446661.)

22777. "Permanent magnets." Darwins, Ltd., and A. Linley. August 4th, 1934. (446894.)

25498. "Television systems." A. D. Blumlein. September 4th, 1934. (446663.)

27120. "Television transmitting systems." J. D. McGee. September 20th, 1934. (446664.)

27383. "Electrical control systems." Sperry Gyroscope Co., Inc. September 23rd, 1933. (446665.)

30893. "High-frequency inductance coils fitted with powdered-iron cores." Johnson Laboratories, Inc. April 9th, 1934. (446743.)

31107. "Automatically controlled electric inspection lamp for motor vehicles." I. M. Lloyd. October 30th, 1934. (446744.)

31131. "Thermionic valve circuits." D. C. Birkinshaw. October 30th, 1934. (446671.)

31171. "Electrically heated thermal-control elements, specially applicable to expansion-type thermal elements forming overload and/or no-volt devices for electric circuit-breakers, contactors and the like." F. B. Cox. October 31st, 1934. (446672.)

31211. "Moving-coil loudspeakers." Ferranti, Ltd., and A. Bennett. October 31st, 1934. (446673.)

31321. "Illuminated indicating scales for radio receivers and like devices." B. Hesketh. November 1st, 1934. (446748.)

31324. "Illuminated dials for wireless receivers and like devices." B. Hesketh. November 1st, 1934. (446749.)

31479. "Electric battery lamps." J. Lucas, Ltd., and F. Hanmer. November 2nd, 1934. (446677.)

31627. "Aerials for wireless signalling." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. November 3rd, 1934. (446680.)

31652. "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. November 3rd, 1934. (446683.)

31893. "Electrically heated vaporisers for use in internal-combustion engines." J. Johnson. November 6th, 1934. (446830.)

31904. "Hand operated devices for electric switches, particularly rotary switches for electric cookers." Diamond H Switches, Ltd., and C. A. Turner. November 6th, 1934. (446832.)

31911. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and J. H. Mitchell. November 6th, 1934. (446833.)

32125. "Electron-discharge devices." Standard Telephones & Cables, Ltd., D. H. Black and W. T. Gibson. November 8th, 1934. (446975.)

32748. "Contact maker for electric organ actions." R. R. Jones and S. Hignett. November 14th, 1934. (446689.)

32769. "Telephone systems." Siemens Bros. & Co., Ltd., W. G. Patterson and R. G. Dixon. November 14th, 1934. (446917.)

32770. "Telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. November 14th, 1934. (446918.)

32941. "Shaft packing devices for dynamo-electric machines." H. C. Wallwork and Associated Electrical Industries, Ltd. November 15th, 1934. (446836.)

33143. "Dynamo-electric machines." Ceskomoravska-Kolben-Danek Co., Ltd., and V. Kauders. November 17th, 1934. (446690.)

33251. "Fluorescent materials and fluorescent screens made therewith." Chemische Fabrik Von Heyden Akt.-Ges. November 18th, 1933. (446765.)

35206. "Electrical junction and distribution boxes." Siemens Bros. Co., Ltd., and C. E. Rose. December 7th, 1934. (446925.)

36495. "Electromagnetic switches as used in telephone and like systems." Siemens Bros. & Co., Ltd., and H. J. Edwards. December 20th, 1934. (Addition to 361519.) (446770.)

37348. "Electric cooker." English Electric Co., Ltd., and E. Barrie. December 31st, 1934. (446928.)

37350. "Electric hot-plates and grillers." English Electric Co., Ltd., and E. Barrie. December 31st, 1934. (446929.)

1935

3047. "Thermionic-valve circuits." J. R. H. Forman and Baird Television, Ltd. January 30th, 1935. (446778.)

3636. "Electric motor control systems." F. Brailsford, C. Dannatt and Associated Electrical Industries, Ltd. February 4th, 1935. (446848.)

4352. "Coin collectors for telephone services and the like." Hall Telephone Accessories (1928), Ltd., and F. W. Hall. February 11th, 1935. (446780.)

5303. "Electric switches for controlling alternating currents." J. Anderson. February 19th, 1935. (446993.)

6367. "Electrically driven clocks or like isochronous devices." Ferranti, Ltd., and H. Easton. February 28th, 1935. (Cognate application 15738/35.) (446932.)

3008. "Plug-and-socket adaptors for electric circuits." Ward & Goldstone, Ltd., and S. Goldstone. March 15th, 1935. (446995.)

3246. "Shock-absorbing mounts for thermionic valves or other electrical devices." C. R. Cook. March 16th, 1935. (446783.)

3556. "Grids for low-pressure electric-arc convertors." General Electric Co., Ltd., and E. Gallizia. March 19th, 1935. (446933.)

8618. "Devices for controlling variable and adjustable condensers." A. R. L. Blemer Soc. March 30th, 1934. (446785.)

11240. "Telephone systems." D. Mastini. December 4th, 1934. (446935.)

11940. "Television receiving circuit." Radioakt.-Ges. D. S. Loewe. April 20th, 1934. (Addition to 435417.) (446707.)

13814. "Electromagnetically operated switchgear or the like electrical apparatus." Whipp & Bourne, Ltd., and F. Whipp. May 3rd, 1935. (446787.)

13447. "Gaseous electric-discharge devices." British Thomson-Houston Co., Ltd. May 8th, 1934. (446860.)

13983. "Oxide cathodes for electric-discharge tubes." Naamlooze Vennotschap Philips' Gloeilampenfabrieken. July 26th, 1934. (446862.)

15407. "Means for automatically regulating an electrical quantity." Allmänna Svenska Elektriska Aktiebolaget. May 28th, 1934. (446790.)

18802. "Repair and anchorage of telegraph poles and the like." B. McMahon. July 1st, 1935. (446795.)

19404. "Magnet assemblies and permanent magnets therefor." R. Bosch Akt.-Ges. July 14th, 1934. (446715.)

19708. "Direct-current voltage changer." Telefonaktiebolaget L. M. Ericsson. July 12th, 1934. (446938.)

22688. "Electrically operated supervisory systems for railway signals." Vereinigte Eisenbahn-Signalwerke Ges. September 10th, 1934. (447008.)

23990. "Apparatus for regulating the current and/or voltage supplies to an electrical apparatus." L. L. De Kramolin. July 27th, 1934. (Divided out of 446736.) (446797.)

24739. "Interrupters of ignition apparatus." R. Bosch Akt.-Ges. September 7th, 1934. (447011.)

25310. "Device for guiding and taking up the slack in the connecting cord of electric flat-irons." K. Gliszizynski. September 12th, 1935. (446948.)

25562. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and General Electric Co., Ltd. September 15th, 1934. (446799.)

26469. "Oscillatory circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. September 29th, 1934. (446804.)

27590. "Gas or vapour filled electric-discharge vessels." Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken Meaf. October 5th, 1934. (446878.)

27781. "Electric heating plates." British Thomson-Houston Co., Ltd. October 8th, 1934. (Addition to 418114.) (446951.)

30126. "Electric-discharge tubes." Soc. Francaise Radio-Electrique. November 16th, 1934. (446956.)

30415. "Windings for induction furnaces." Schloemann Akt.-Ges. February 19th, 1935. (447015.)

30725. "Electric motor control systems." Westinghouse Electric & Manufacturing Co. November 13th, 1934. (446808.)

31560. "Lighting equipment and the arrangement thereof in the enclosures or vehicles." Patent License Corporation. February 2nd, 1935. (446882.)

32234. "Boundary beacon lights for air ports." E. Curran. November 21st, 1935. (447022.)

33420. "Device for modifying the degree of selectivity and accurate reproduction of a wireless receiving apparatus." E. K. Cole, Ltd. April 11th, 1935. (446809.)

1936

301. "Telephone systems." C. Lorenz Akt.-Ges. January 30th, 1935. (446732.)

1282. "Electric switching devices particularly adapted for use in electric motor control systems." Westinghouse Electric & Manufacturing Co. January 19th, 1935. (446887.)

1871. "Electric motor control systems." Westinghouse Electric & Manufacturing Company. February 28th, 1935. (446888.)

3808. "Construction of electrodes for electric-discharge devices." British Thomson-Houston Co., Ltd. February 8th, 1935. (446734.)

Trade Mark Applications

The Registrar of the Trade Marks Department has just given notice that applications in respect of the word "Coronation" as a new trade mark will only be entertained in those exceptional cases where the word is not likely to be used in connection with the class of goods concerned to indicate their date and is not likely to be required by other traders in such goods in the ordinary course of their business for use for other purposes.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 27th:—

Flowers and Circle (design only). No. 563943. Class 5. Wire.—John Rigby & Sons, Ltd., Adelphi Wire Mills, North George Street, Salford, Manchester.

Matelux. No. 567320. Class 8. Electric lamps for photographic purposes.—Modern Traders, Ltd., 8-10, Oxford Circus Avenue, 231, Oxford Street, W.1.

Corpatact. No. 568153. Class 8. Capacity-operated electrical switches.—A. C. Alexandra & Co., Buchanan Buildings, 24, Holborn, E.C.1.

Phililite. No. 566532. Class 13. Electric lighting fittings.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Hoplite. No. 563815. Class 15. Advertising signs made wholly or principally of glass.—David G. Sadler, Abbotsford, Abbots Road, Abbots Langley, Herts.

Rock. No. 564882. Class 50. Insulating parts of electric lighting, heating and power fittings, all made from synthetic resin.—Ranton & Co., Ltd., Claremont Road, Cricklewood, N.W.2.

Mixarta. No. 567555. Class 50. Sheets, panels and tubes and other shaped pieces and articles made from a composition chiefly of vegetable or mineral fibre or paper with synthetic resin or the like as a binder.—Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., U.S.A. (British representative: G. Raymond Shepherd, 2, Norfolk Street, Strand, W.C.2).

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—News Theatre, Diamond Street, for the North of Scotland News Theatres (Aberdeen), Ltd.; the secretary.

Amblecote (WORCESTERSHIRE).—Houses (24); Webb & Gray, architects, Dudley. Cinema, High Street, for Leon Salberg & S. W. Clift.

Ampthill.—Church, High Street, Clophill, for the Methodist trustees; secretary.

Armadale.—Houses (62); T. Roberts, 22, George Street, Bathgate.

Ashford (KENT).—Extensions to isolation hospital, including administration and cubicle blocks; A. F. Webster, U.D.C. surveyor, 5, North Street.

Audenshaw (LANCASHIRE).—St. Hilda's Church (electrical work); Rev. Roland Jones, vicar.

Aylesbury.—R.C. church, High Street; Canon J. Tonks.

Ayrshire.—Maternity home, Kilwinning, and clinic and library, Cumnock, electrical work; W. Reid, county architect, Ayr.

Barking.—Extensions to factory, Creeksmouth; De Pass Fertilisers, Ltd., Barking Guano Works, Creeksmouth. Houses (533); borough engineer.

Barnstaple.—Houses (50); H. Branch, builder.

Bedford.—Houses (60); borough engineer.

Bedwellty.—Houses (106); U.D.C. surveyor.

Birkenhead.—Houses and flats, Buccleuch estate (£50,970); Lloyd & Cross, Ltd. Cinema, Woodchurch Road, Prenton; Regal Co.

Birmingham.—Cinema for Jacey Cinemas, Ltd. Shops and houses, Lichfield to Coleshill Road, Bassetts Pole, Four Oaks; C. A. Wareing, New Park Estates, Ltd., builders.

Blaydon-on-Tyne.—Houses; U.D.C. surveyor.

Bolton.—Houses (46), Wisbeck Street; F. Merrison, Ltd. Extensions to works, Garside Street; Rigby Taylor, Ltd.

Bournemouth.—Reconstruction of Bournemouth school (£51,000), for E.C.

Bridgnorth.—Houses (20), Highley Garden village; R.D.C. surveyor.

Bridlington.—Houses and bungalows; borough surveyor.

Chartham (KENT).—Houses (60); Mr. Kenworthy, 27, St. Stephen's Road, Canterbury.

Chester.—Houses (130); city surveyor.

Clacton-on-Sea.—St. Monica's school (£21,000), electrical work; A. J. Arnold, builder, Chelmsford.

Coventry.—Theatre for the Coventry Hippodrome Co., Ltd.

Dalbeattie.—Houses (32); R. Flinn, burgh surveyor.

Devizes.—Houses (52); R.D.C. surveyor.

Dudley.—Shops and flats, New Street; F. H. Gibbons, borough engineer.

Dundee.—Premises, Murraygate, for James Grant & Co., Ltd. School, St. Mary's Lane; Allan & Friskin, architects, 26, Castle Street.

Durham.—School, Waterhouses, for C.C., to replace existing school; F. Willey, architect, 34, Old Elvet.

East Sussex.—School (250 places), Seaford; director of education, Lewes.

Eastleigh (HAMPSHIRE).—Factory, for Price Bros., Prudential Buildings, Southampton. Extensions to works, for Pirelli-General Cable Works, Ltd.

Eccles.—Houses (23), Gillingham Road; S. L. Crompton.

Edinburgh.—Extension to Haymarket Flour Mills, for J. Herdman & Sons, Ltd.; G. & J. Cameron, 64, Duff Street.

Epsom.—Central school (£26,604); Truett & Steel, Ltd.

Folkestone.—Houses (67); E. L. Allman, borough engineer.

Gateshead-on-Tyne.—Synagogue at the junction of Rectory Road and Bewick Road; R. G. Pearson, architect, Jesmond Road, Newcastle-on-Tyne.

Glasgow.—Houses (20), Robert Street, Govan; housing director. Buildings, Cleveden Drive, for the Homœopathic Hospital Board (£200,000); James Taylor, 220, West Regent Street.

Great Yarmouth.—Houses (20); borough engineer.

Guildford.—Houses (164), Westborough estate (£52,713); Herbert Ashenden. Block of shops and flats, Farnham Road and Railway Approach; Boyd Scott, architect. Extensions to works, By-pass road; Warner Engineering Co.

Halifax.—Houses, bungalows and flats, electrical work; D. T. Lloyd Jones, borough engineer, Crossley Street.

Hanley.—Houses (34), near Etruria Vale Road; J. Whittaker. Factory, Slippery Lane; Alcock, Lindley & Bloore.

Hatfield (HERTFORDSHIRE).—Houses, Birchwood; R.D.C. surveyor.

Hereford.—Houses, Hinton Court estate; Nicholson & Scriven, architects. Premises, Bridge Street, for Franklyn Barnes & Co.; Bettington & Son.

Holme Chapel (CHESHIRE).—Factory, staff quarters and laundry for Benger's Food, Ltd., Manchester.

Hull.—Shops and flats, Endyke estate; Tarran Industries, Ltd. School, Taylor Avenue; city architect.

Irish Free State.—(THURLES, Co. TIPPERARY).—Houses (101); T. J. Hyland, town surveyor.

Kettering.—Houses (100), Avondale estate; U.D.C. surveyor, Gold Street.

Lanarkshire.—Houses, Bellshill and Blantyre, for C.C.; J. Stewart, Albert Street, Motherwell.

Lancashire.—Grammar school, Barrowford Road, Colne; director of education, Preston. Extensions to Whiston institution (£31,000), for the P.A.C.; county architect, Preston. Extensions to Lake Hospital, Ashton-under-Lyne (£29,495), for County P.A.C.; county architect, Preston.

Lancaster.—Houses (54), Willow estate (£15,275); Nicholson & Wright, Ltd.

Leatherhead.—Houses (178), Oakenwood estate, Great Bookham; Nightingale, Page & Bennett, surveyors, Surbiton.

Liverpool.—Extensions to Unity House, for the Co-operative Society, Ltd., 162, Walton Road; Ormrod & Banister, architects, 20, Bluecoat Chambers, School Lane.

London.—(PARK ROYAL, N.W.10).—Extensions to factory for Serck Radiators, Ltd. (WESTMINSTER).—Air mail station, Buckingham Palace Road; Imperial Airways, Ltd. Offices, 23-5, Soho Square; Housing Corporation of Gt. Britain, Ltd., 50, Pall Mall, S.W.1.

Longport (STAFFORDSHIRE).—Houses and shops, Davenport Street and Liverpool Road; Tilstone & Bailey.

Luton (BEDFORDSHIRE).—Church, Round Green; Professor A. E. Richardson, architect.

Meir (STAFFORDSHIRE).—Development of Hillside Farm estate; Hillside Housing & Estate Co.

Middlesbrough.—Houses near Hutton Road for the owners of the Middlesbrough Estate, Ltd.; F. Jackson, architect, Queen's Square.

Milnrow.—Houses (42), Holt estate; A. Travis, architect, New Market Chambers, Rochdale.

Neath.—Houses, Bryncoch and Tonmawr; J. T. Jones, R.D.C. engineer, 13, Orchard Street.

Norham (NORTHUMBERLAND).—Houses (40); R.D.C. surveyor.

North Riding.—Pavilions for nurses, &c., (£42,000), Claypenny Colony, Easingwold, for C.C.; county architect, Northallerton.

Nottingham.—Reconstruction of wholesale markets (£55,000); city engineer.

Oldbury.—Three schools, Moat Farm estate (£30,000); director of education.

Orpington (KENT).—Cinema, Queensway, Petts Wood; Bovis, Ltd., builders, Upper Berkeley Street, London, W.1.

Oxford.—Houses (45), Marston estate; J. F. Richardson, city engineer.

Patcham.—Houses (34), Greenfield Crescent; C. W. Parkes.

Penistone (YORKSHIRE).—Houses (34), Bull Haw Lane, Silkstone; Lunn & Kaye, architects, Milnsbridge, Huddersfield.

Penryn.—Premises for Penryn and Falmouth Steam Laundry Co.

Plymouth.—Houses (76), Camel's Head estate; St. Aubyn Estates, Ltd. Flats, Wolseley Road (£20,703); A. N. Coles, Ltd. Reconstruction of Cattedown Road and Treville Street schools; city architect.

Pocklington (YORKS).—Public library, council room, &c., for the Parish Council; J. Butterworth, clerk, Regent House.

Ridgmont (BEDFORDSHIRE).—Houses (88), Brogborough Hill, for Marston-Ridgmont Properties, Ltd.

St. Helens.—School for the Catholic Authorities of Holy Cross; W. Ellis, architect, Union Bank Chambers, Hardshaw Street.

Sheffield.—Factory, for Lee & Crookes, Ltd., celluloid manufacturers. Houses (33), Elm Field Avenue; S. G. Bailey. Houses (76). Parsons Cross (£24,846); Melling Bros., Ltd. Elementary school, Halifax Road (£73,500); city architect.

Smethwick.—Houses (96), Halnes Lane (£23,412); borough engineer. Extensions to works, Bearwood Road; British Pens, Ltd. Extensions to works, Rabone Lane; Geo. Burn, Ltd.

Southend-on-Sea.—Alterations to Palace Hotel; Instone Bloomfield. Business store, with arcades, Victoria Circus, for J. F. Dixon, draper.

Stockport.—Boys' secondary school (£50,000), for Borough E.C.; E. Taylor & Co., builders, Littleborough, Rochdale.

Stoke-on-Trent.—Houses near Blurton Road; P. Bailey & Co., Ltd. Baths, Wharf Street (£31,000); city engineer.

Stonehouse (GLOUCESTERSHIRE).—Houses (100), Bridgend, for A. Halls.

Stourbridge.—Houses (68), Wollaston; A. M. Griffiths & Son, Ltd., builders, Wolverhampton.

Stranraer.—Cinema, St. Andrew's Street; manager, The Cinema.

Sunderland.—Houses (20), Sidecliff estate; Bell Bros., builders, Bk. Cleveland Road. Five schools and rebuilding of others; director of education.

Surrey.—Alterations to school, Warlingham, for County E.C.

Sutton Coldfield.—Houses (74), Holland House estate (£27,800); borough engineer. Houses (20), Sutton Oak Road; W. E. Cobbett.

Swansea.—Extensions to technical college (£55,000), for E.C.; Ernest Morgan, borough architect.

Teddington.—Store, Film studios, Broom Road; Warner Bros., Ltd.

Twickenham.—Flats and shops, Richmond Road, for O. Howard Leicester. R.C. church, school and presbytery, St. Margaret's; Rev. Fr. McGuckin, rector.

Tynemouth.—Church, Ridges estate; Bishop of Newcastle.

Warrington.—Works, Chester Road, for F. White, Ltd., Liverpool.

Warwick.—Houses (79), Myton Road, for Leam House Estates, Ltd.

West Bromwich.—Houses (96), Friar Park estate; W. Kendrick & Sons. Extensions to works, Holloway Bank; W. Charles, Ltd.

West Byfleet.—Central school (£15,528); W. F. Blay, Ltd.

West Sussex.—School, Selsey (£20,650), for County E.C.; county architect, Chichester.

Whitley Bay.—Houses, Bromley Avenue and Marina Avenue; H. Kaye, architect, 26, Windsor Gardens, Monkseaton.

Winchester.—Power house, Hamble, for British Marine Aircraft Co.

Wittersham.—Houses for J. Read Highthorn, Rottingdean, Brighton.

Wrexham.—Central school; director of education.